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(54) **LINK MECHANISM**

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(57) **ABSTRACT**

A link mechanism includes a drive device, a driven member, a first drive force transmission mechanism, a second drive force transmission mechanism and a transmission path switch device. The drive device generates a drive force. The driven member is moved by the drive force. The first drive force transmission mechanism transmits the drive force toward the driven member at a speed reduction ratio which is predetermined. The second drive force transmission mechanism transmits the drive force toward the driven member at a speed reduction ratio which is different from the speed reduction ratio of the first drive force transmission mechanism. The transmission path switch device switches a transmission path, along which the drive force is transmitted from the drive device toward the driven member, to one of the first drive force transmission mechanism and the second drive force transmission mechanism.

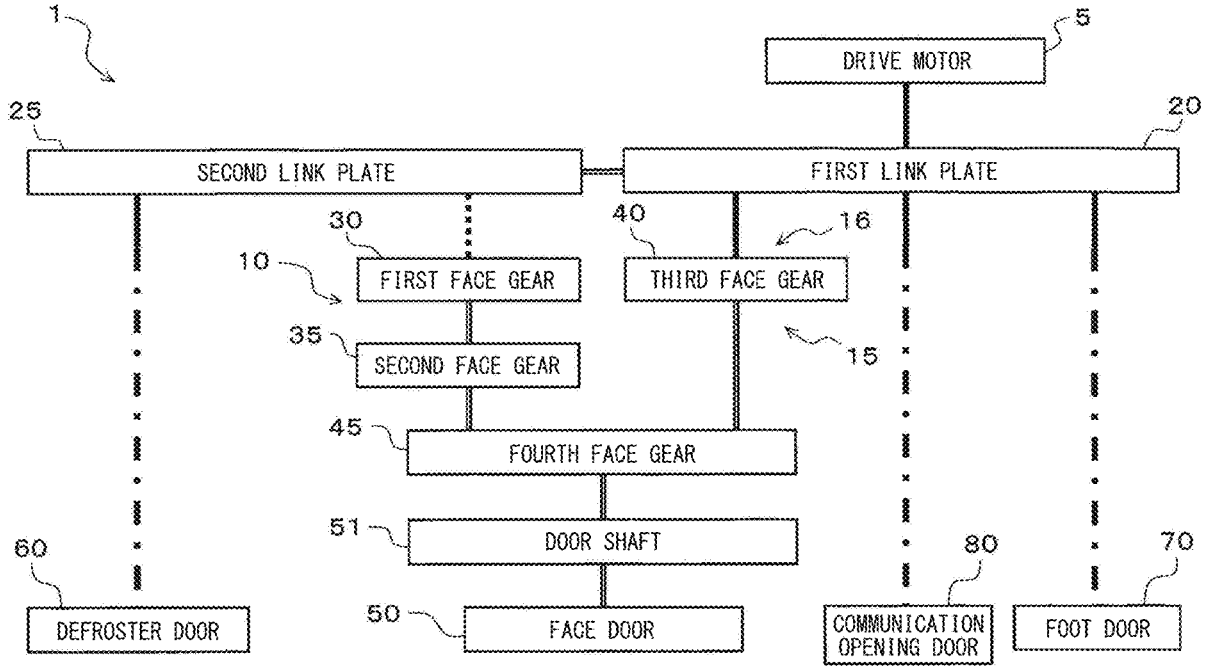


FIG. 1

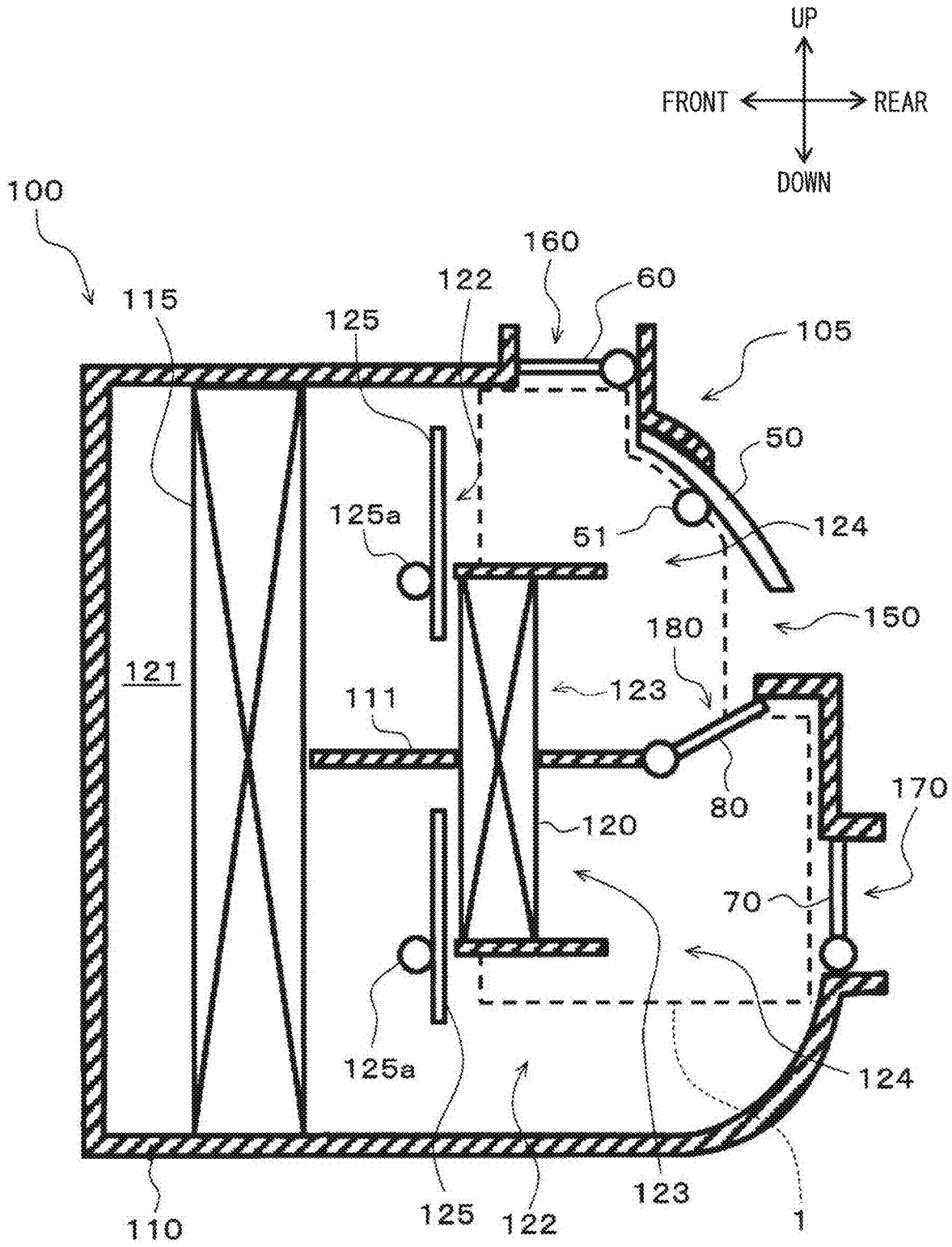

UP
FRONT
REAR
DOWN
100
115
125
122
160
60
105
50
125a
51
124
150
180
121
111
123
80
170
120
70
125a
124
110
125
122
123
1

FIG. 2

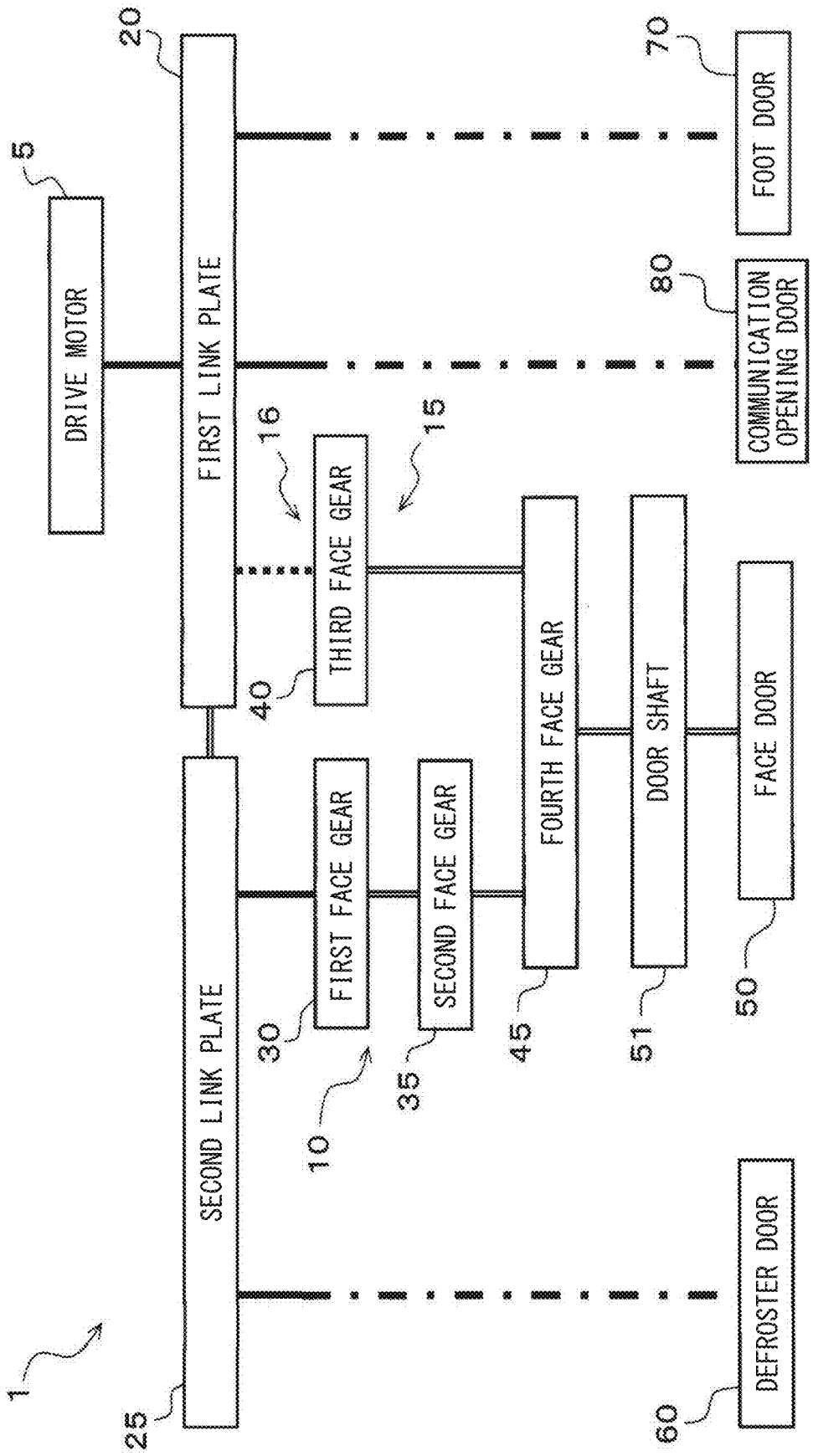

1
5
DRIVE MOTOR
20
FIRST LINK PLATE
25
SECOND LINK PLATE
10
16
15
40
THIRD FACE GEAR
30
FIRST FACE GEAR
35
SECOND FACE GEAR
45
FOURTH FACE GEAR
51
DOOR SHAFT
50
FACE DOOR
60
DEFROSTER DOOR
70
FOOT DOOR
80
COMMUNICATION OPENING DOOR

FIG. 3

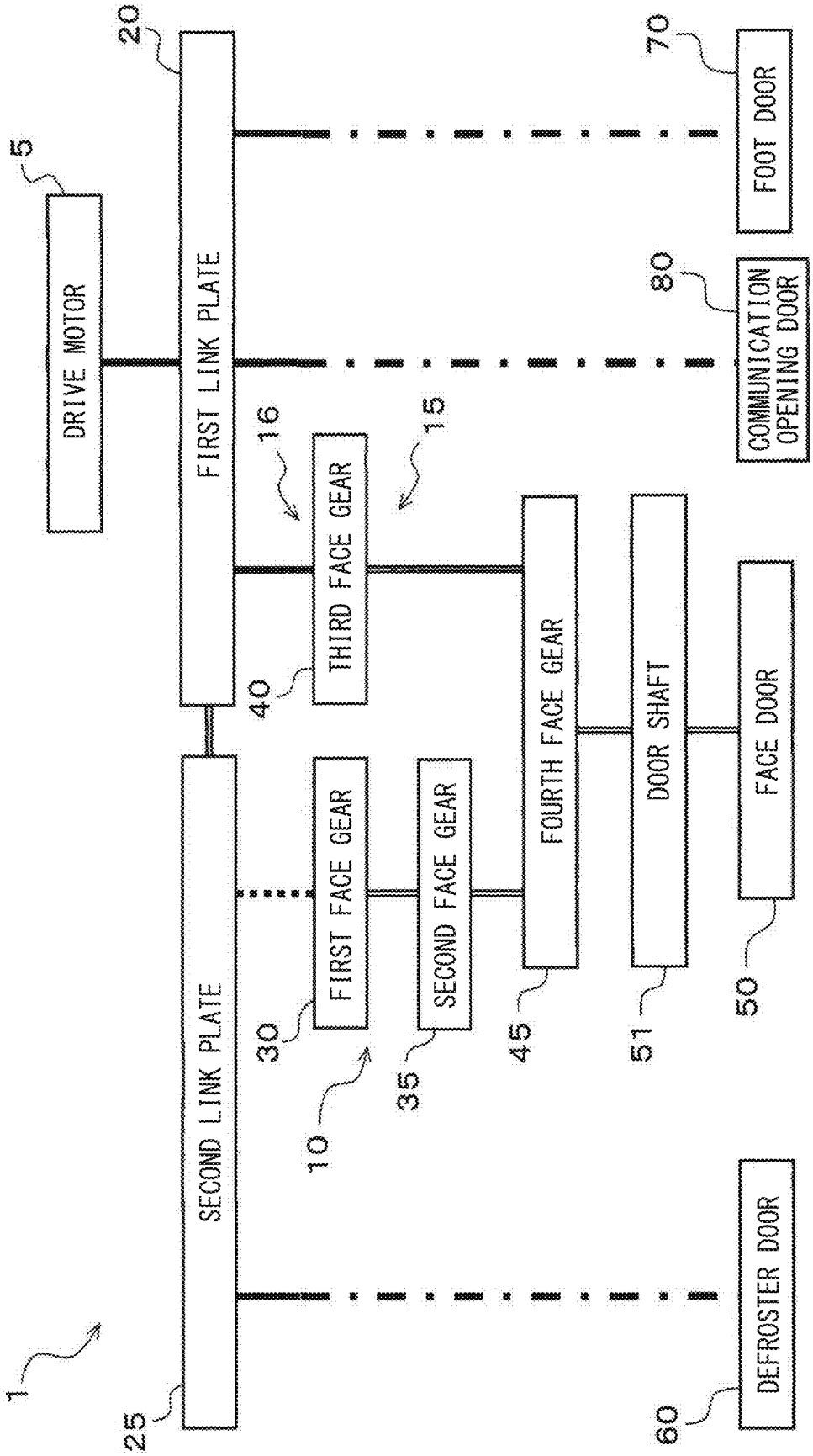
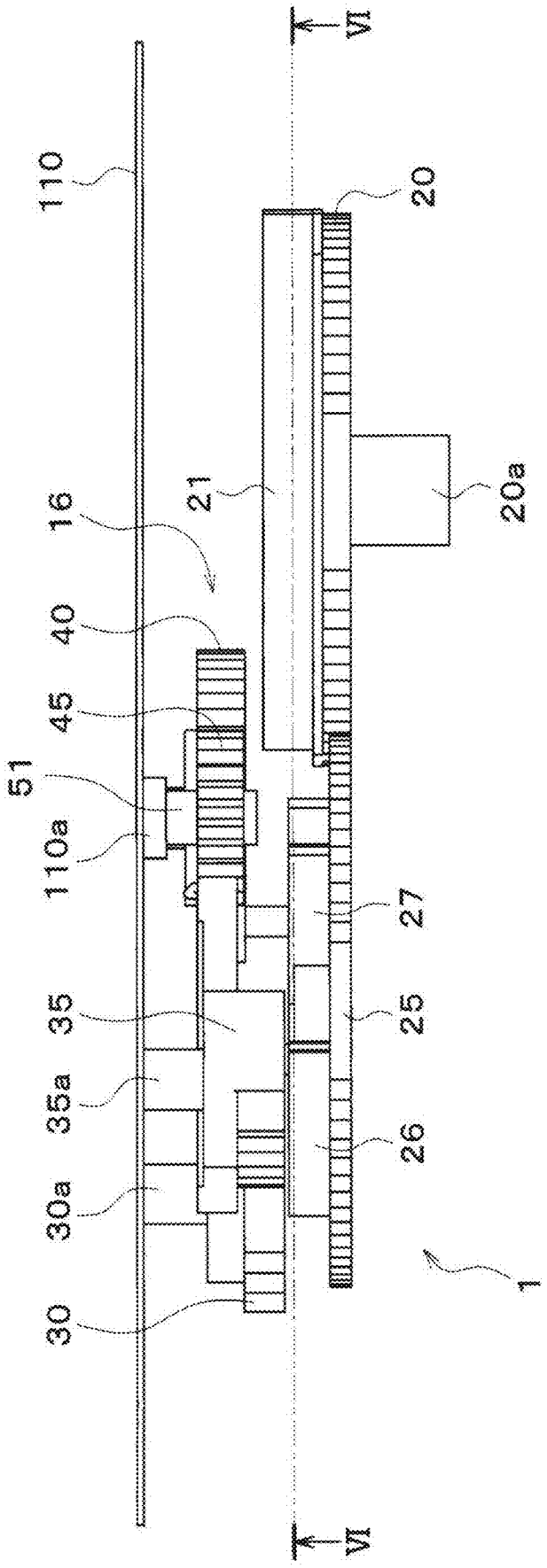

1
5
DRIVE MOTOR
20
FIRST LINK PLATE
25
SECOND LINK PLATE
10
16
15
40
THIRD FACE GEAR
30
FIRST FACE GEAR
35
SECOND FACE GEAR
45
FOURTH FACE GEAR
51
DOOR SHAFT
50
FACE DOOR
60
DEFROSTER DOOR
70
FOOT DOOR
80
COMMUNICATION OPENING DOOR

FIG. 4



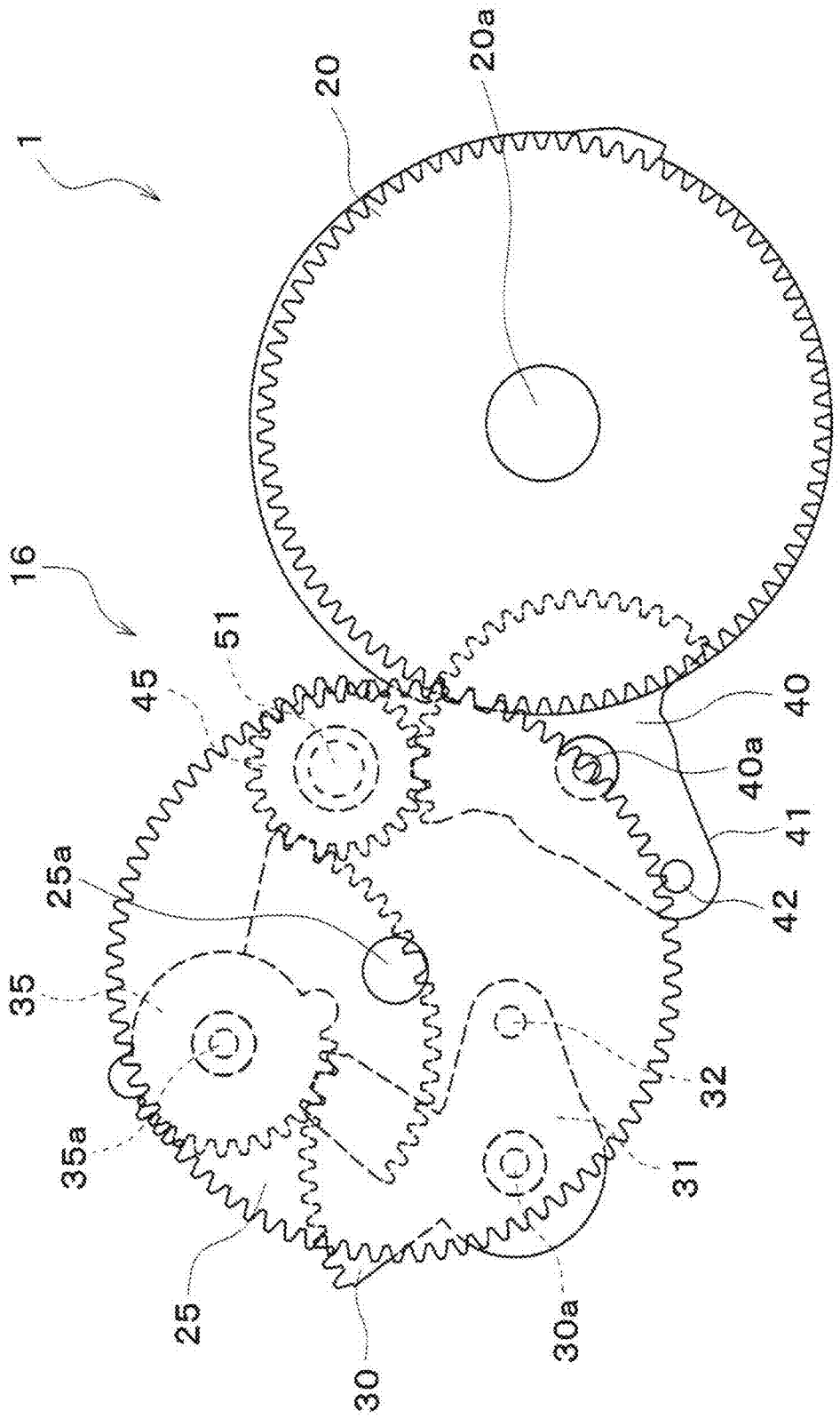
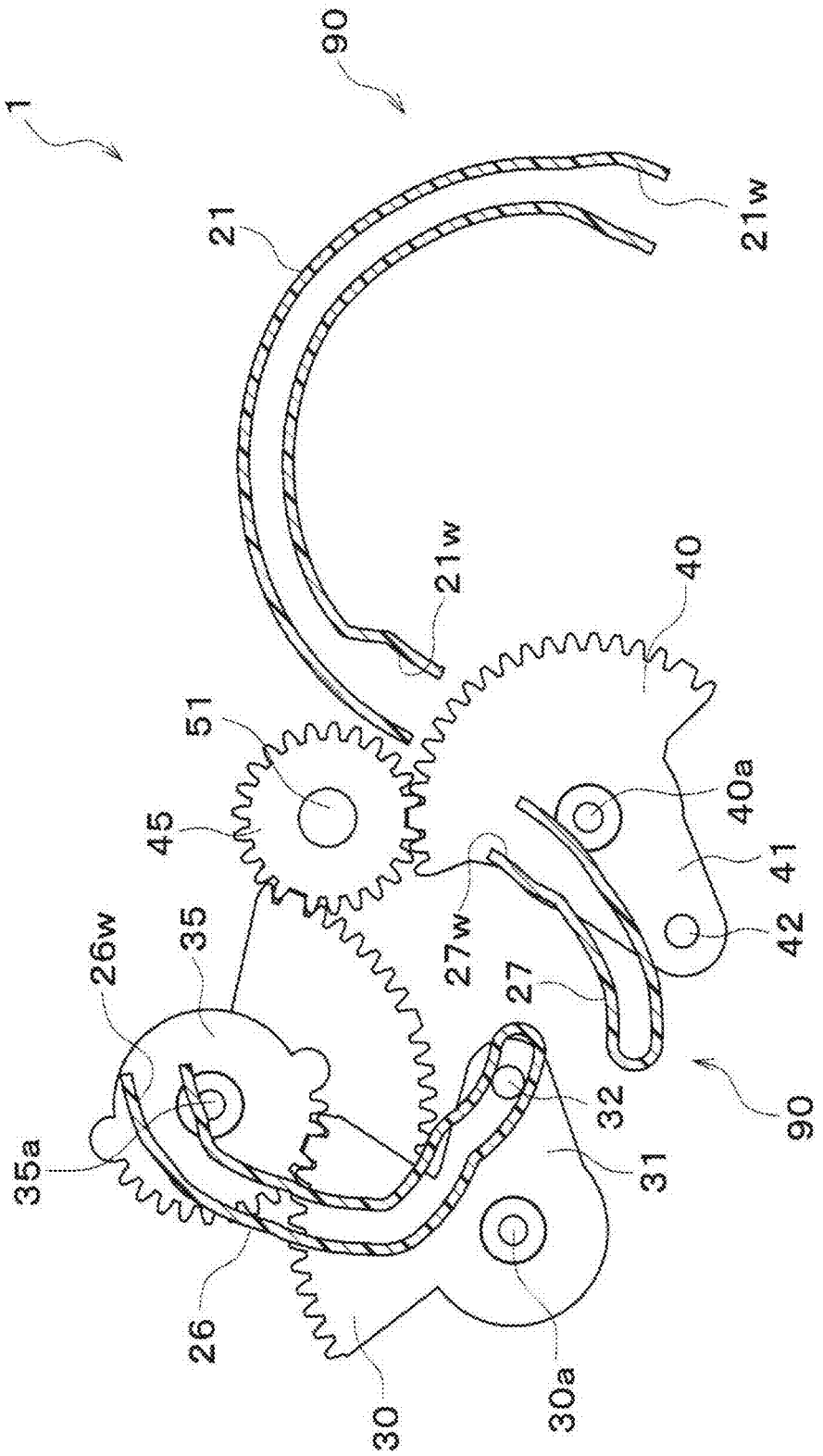


FIG. 5

FIG. 6


90
1
21
21w
21w
40
51
40a
45
41
42
27w
27
26w
35
32
90
35a
31
26
30
30a

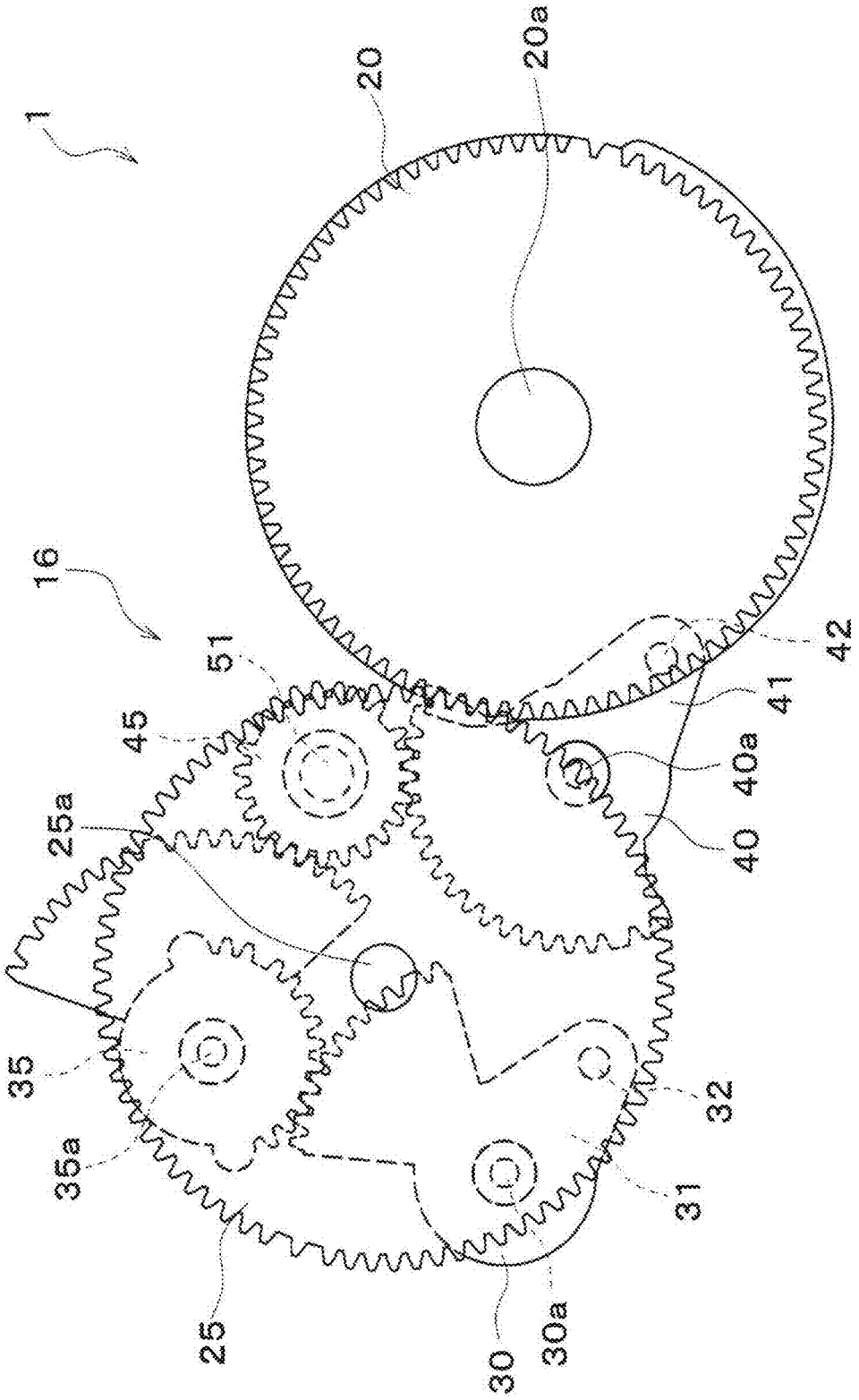


FIG. 7

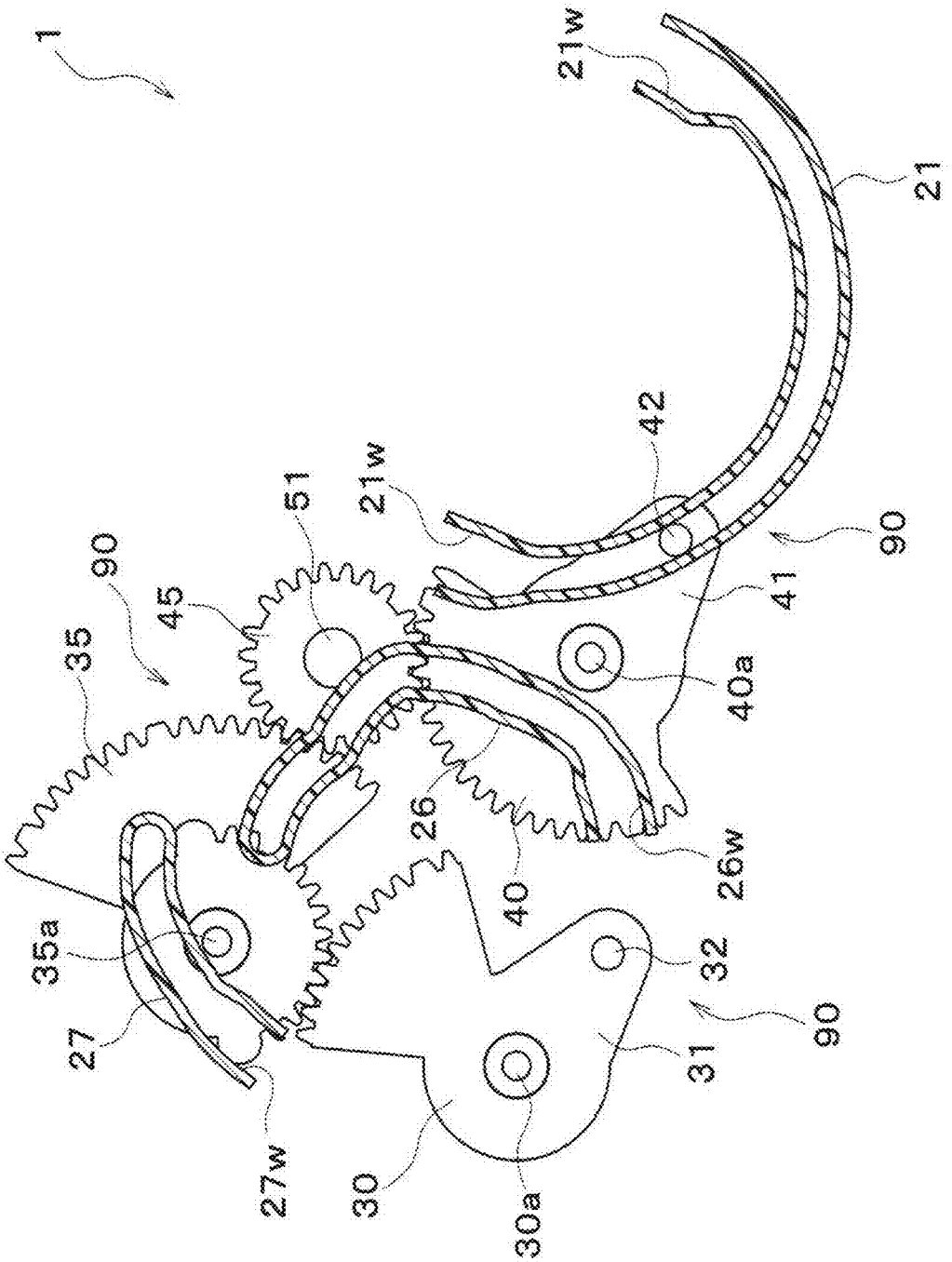

1
21w
21
42
51
21w
90
45
41
35
40a
26
26w
40
35a
32
27
90
31
27w
30
30a

FIG. 8

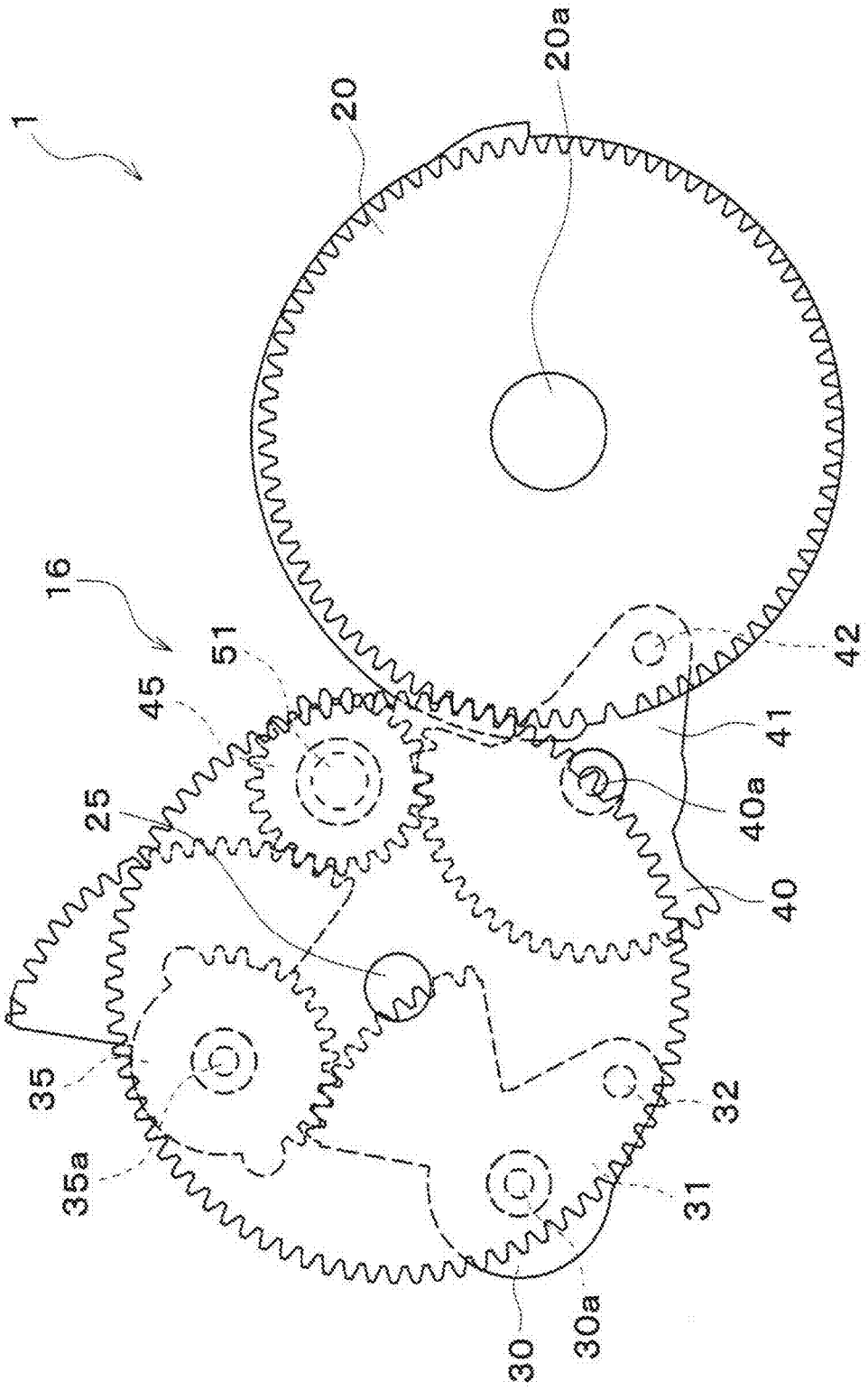


FIG. 9

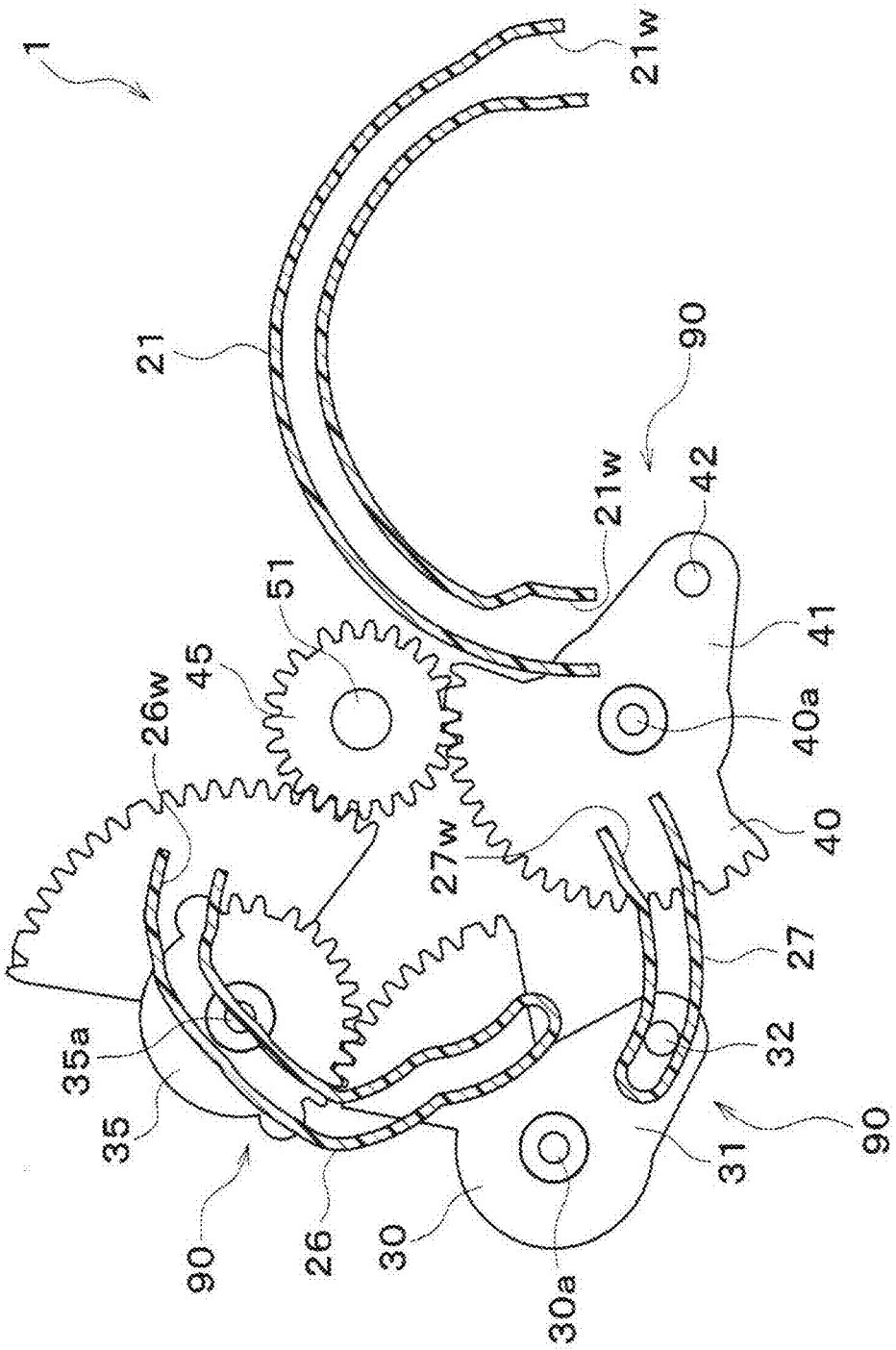

1
21w
21
90
21w
42
51
45
41
26w
40a
27w
40
27
35a
32
35
90
31
90
26
30
30a

FIG. 10

FIG. 11

LINK PIN OF FIRST FACE GEAR	CONTACT SUBJECT: SECOND LINK GROOVE	NON-CONTACT	NON-CONTACT	NON-CONTACT	CONTACT SUBJECT: THIRD LINK GROOVE
LINK PIN OF THIRD FACE GEAR	NON-CONTACT	NON-CONTACT	CONTACT SUBJECT: FIRST LINK GROOVE	NON-CONTACT	NON-CONTACT
TRANSMISSION MECHANISM	FIRST DRIVE FORCE TRANSMISSION MECHANISM	-	SECOND DRIVE FORCE TRANSMISSION MECHANISM	-	FIRST DRIVE FORCE TRANSMISSION MECHANISM
TRANSMISSION PATH (DETAIL)	FIRST LINK PLATE ↓ SECOND LINK PLATE ↓ FIRST FACE GEAR ↓ SECOND FACE GEAR ↓ FOURTH FACE GEAR ↓ DOOR SHAFT	-	FIRST LINK PLATE ↓ THIRD FACE GEAR ↓ FOURTH FACE GEAR ↓ DOOR SHAFT	-	FIRST LINK PLATE ↓ SECOND LINK PLATE ↓ FIRST FACE GEAR ↓ SECOND FACE GEAR ↓ FOURTH FACE GEAR ↓ DOOR SHAFT
STATE	NORMAL DRIVE	MODE SHIFT	HIGH PRECISION DRIVE	MODE SHIFT	NORMAL DRIVE
CORRESPONDING BLOWOUT MODE	FACE MODE BI-LEVEL MODE	-	FOOT MODE	-	DEFROSTER MODE FOOT DEFROSTER MODE

FIG. 12

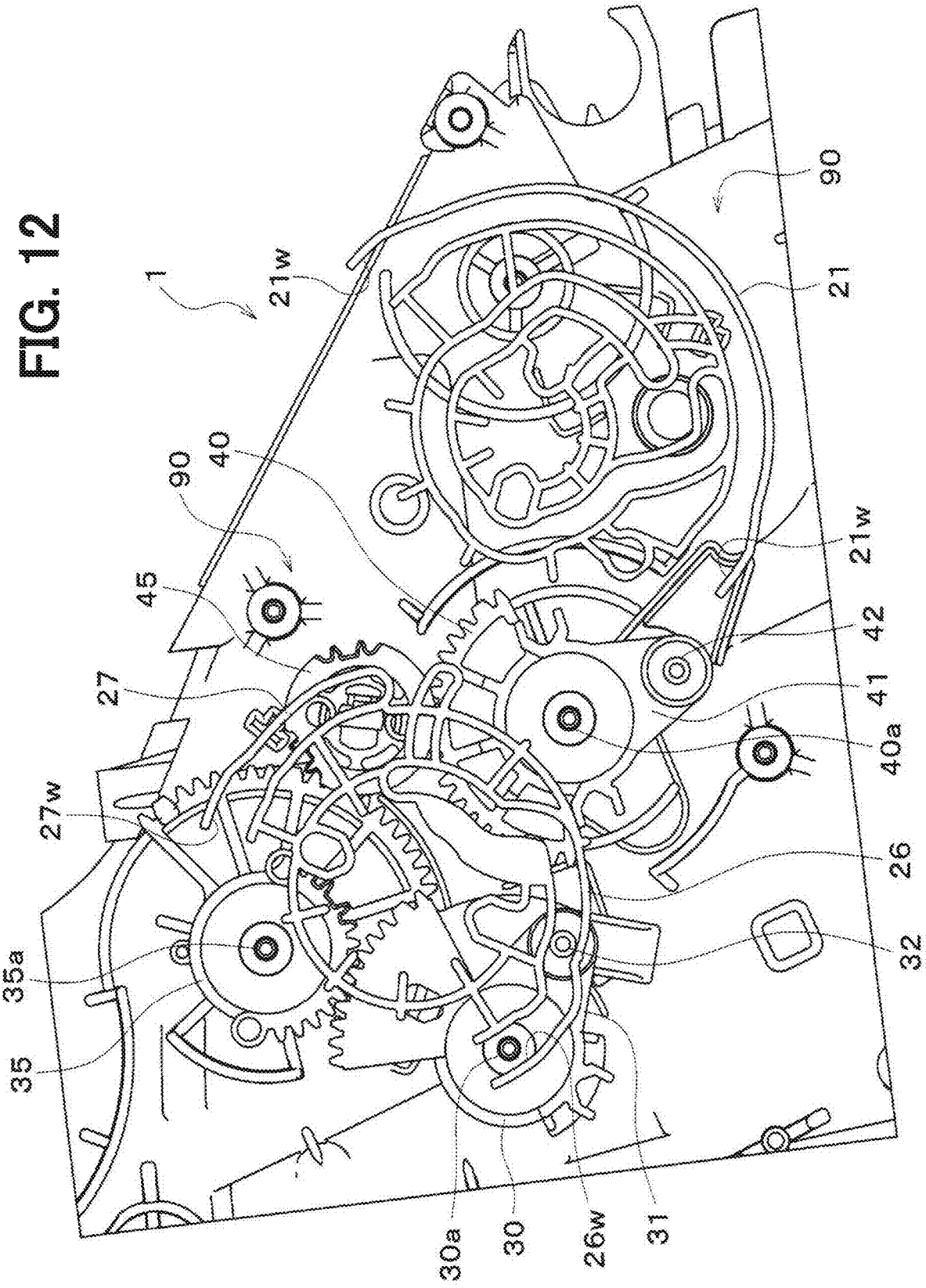


FIG. 13

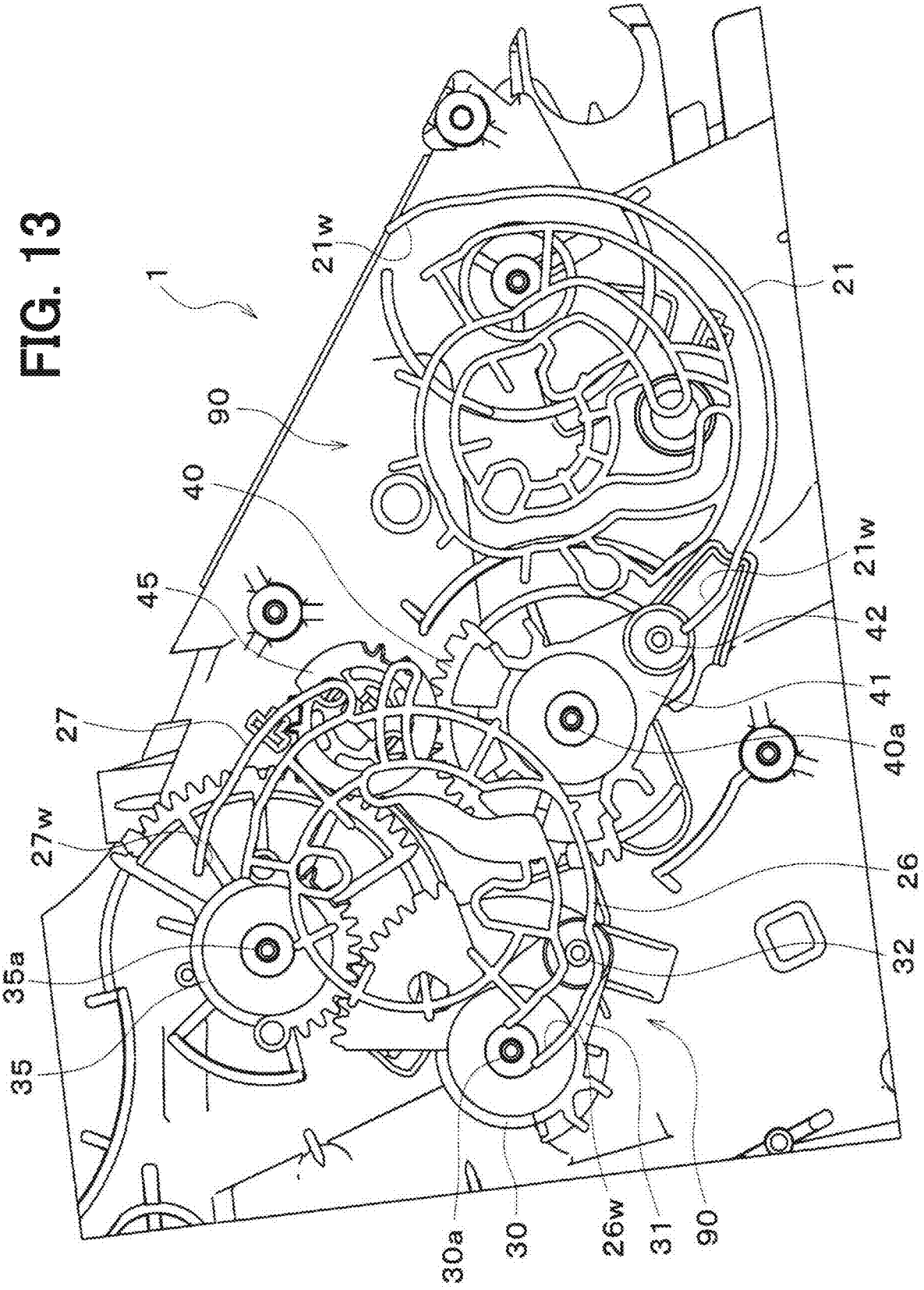


FIG. 14

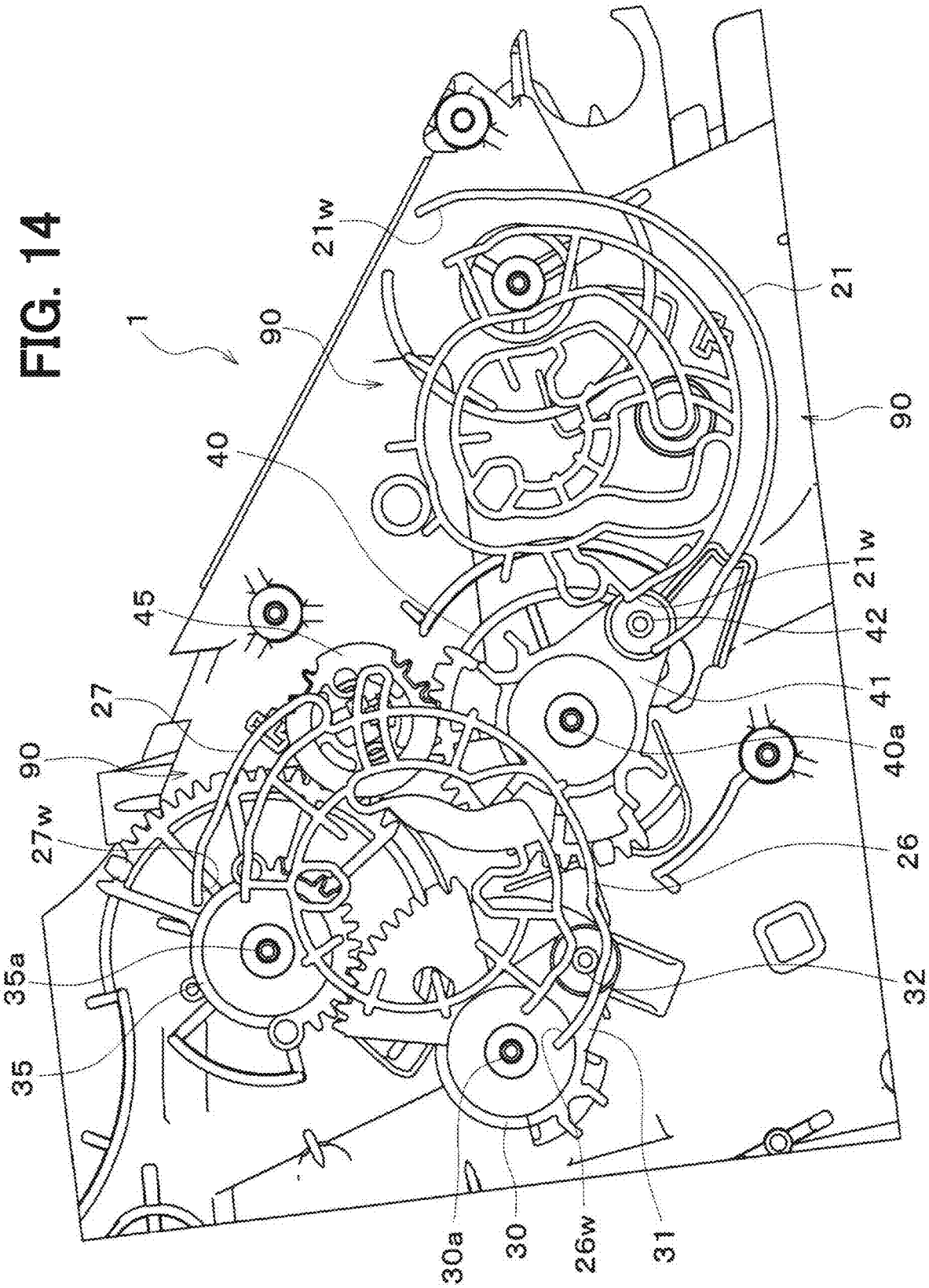

1
90
21w
21
40
90
45
21w
42
41
27
40a
90
27w
26
35a
32
35
30a
30
26w
31

FIG. 15

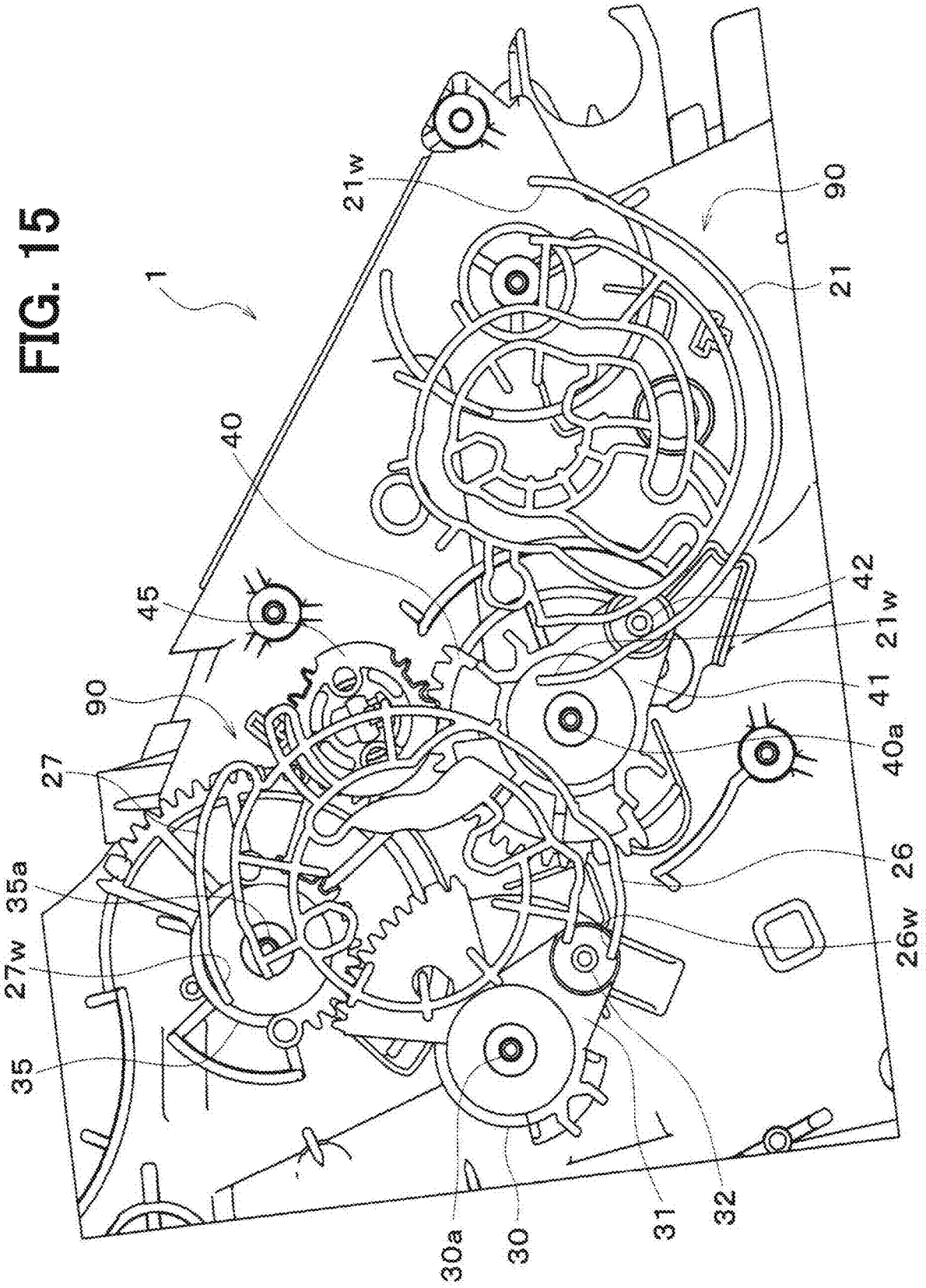


FIG. 16

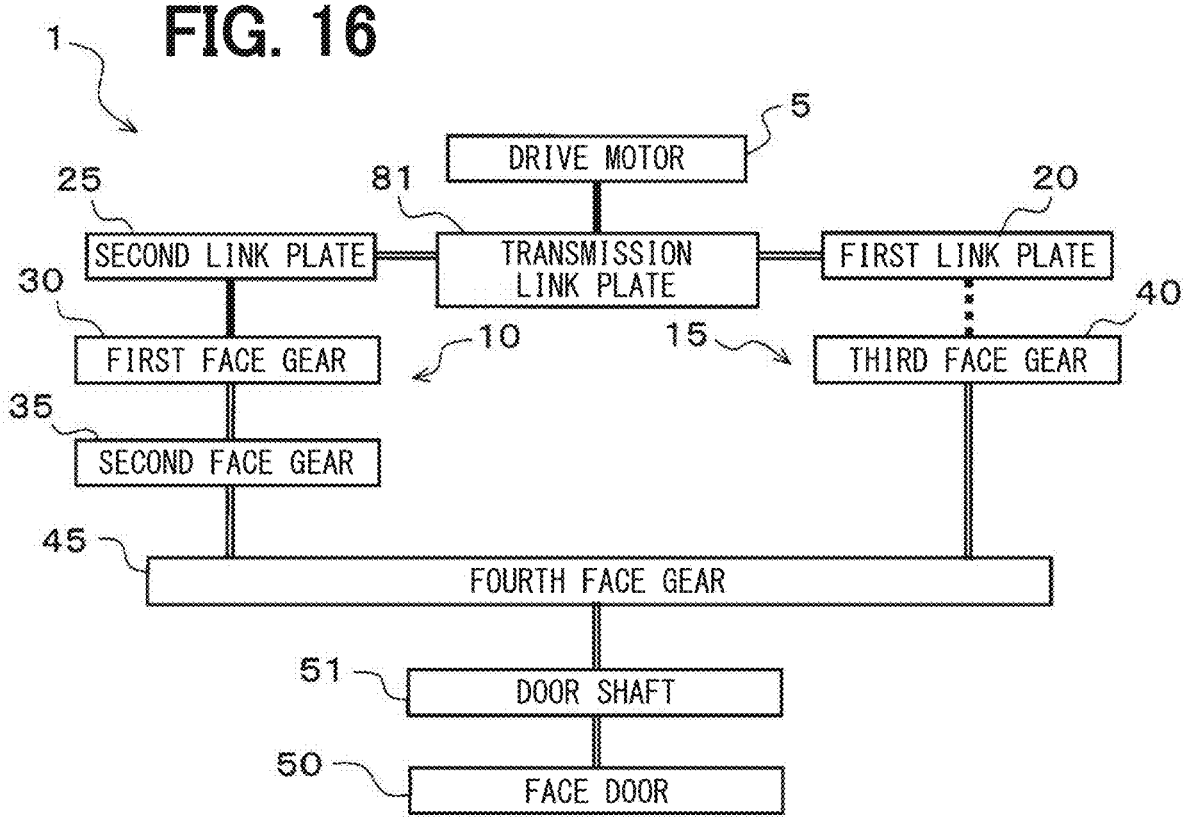

1
5
DRIVE MOTOR
25
81
20
SECOND LINK PLATE
TRANSMISSION LINK PLATE
FIRST LINK PLATE
30
40
10
15
FIRST FACE GEAR
THIRD FACE GEAR
35
SECOND FACE GEAR
45
FOURTH FACE GEAR
51
DOOR SHAFT
50
FACE DOOR

FIG. 17

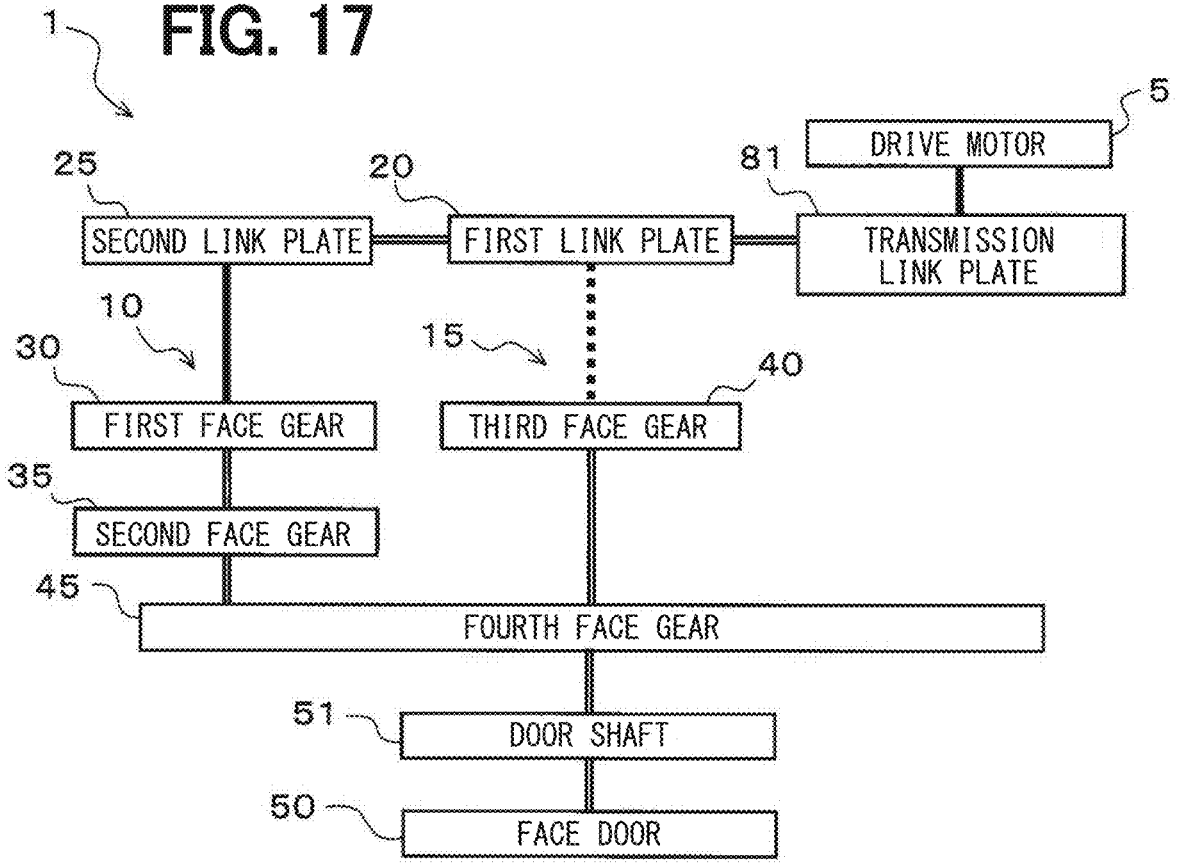

1
5
DRIVE MOTOR
25
20
81
SECOND LINK PLATE
FIRST LINK PLATE
TRANSMISSION LINK PLATE
10
15
30
40
FIRST FACE GEAR
THIRD FACE GEAR
35
SECOND FACE GEAR
45
FOURTH FACE GEAR
51
DOOR SHAFT
50
FACE DOOR

FIG. 18

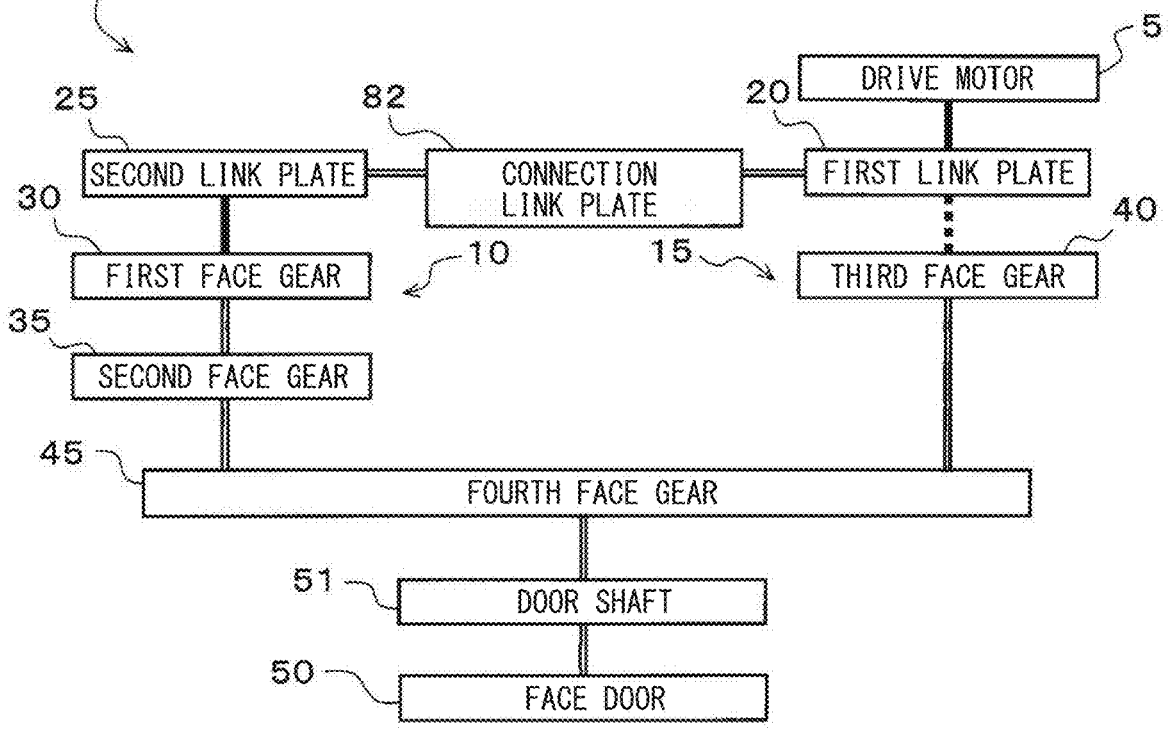

1
5
DRIVE MOTOR
25
82
20
SECOND LINK PLATE
CONNECTION LINK PLATE
FIRST LINK PLATE
30
40
10
15
FIRST FACE GEAR
THIRD FACE GEAR
35
SECOND FACE GEAR
45
FOURTH FACE GEAR
51
DOOR SHAFT
50
FACE DOOR

FIG. 19

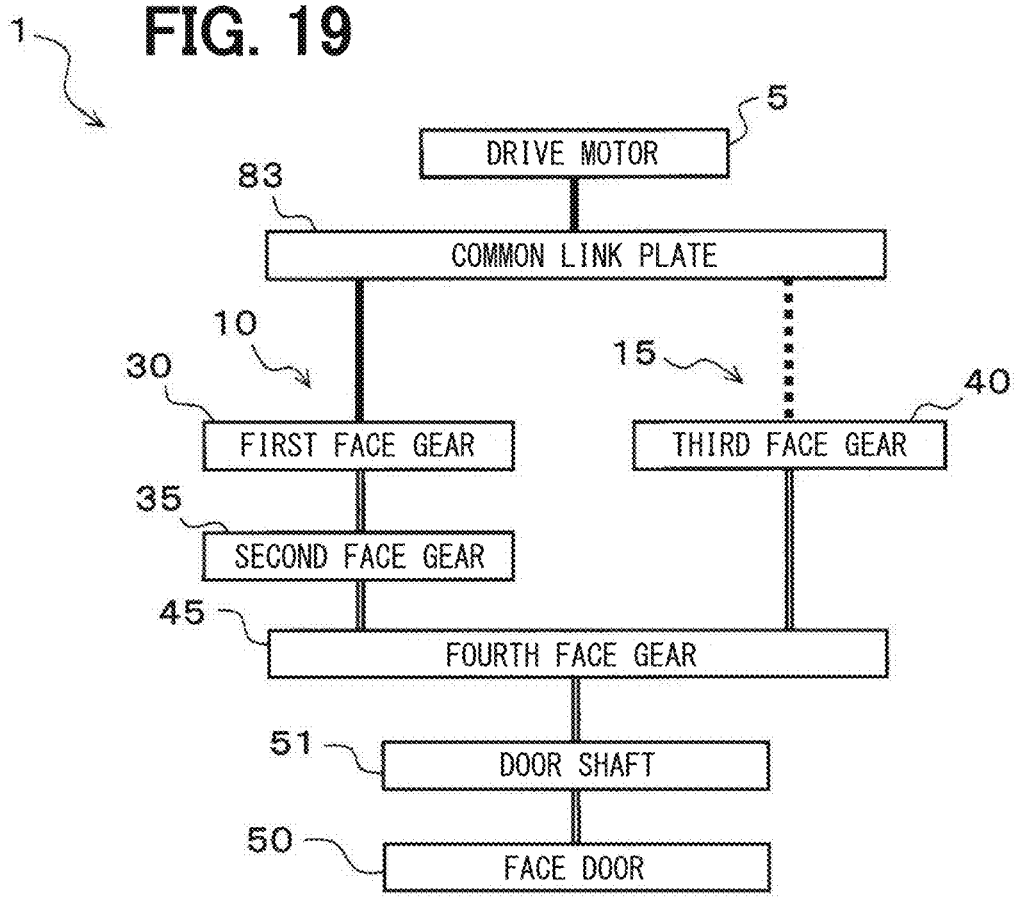

1
5
DRIVE MOTOR
83
COMMON LINK PLATE
10
15
30
40
FIRST FACE GEAR
THIRD FACE GEAR
35
SECOND FACE GEAR
45
FOURTH FACE GEAR
51
DOOR SHAFT
50
FACE DOOR

FIG. 20

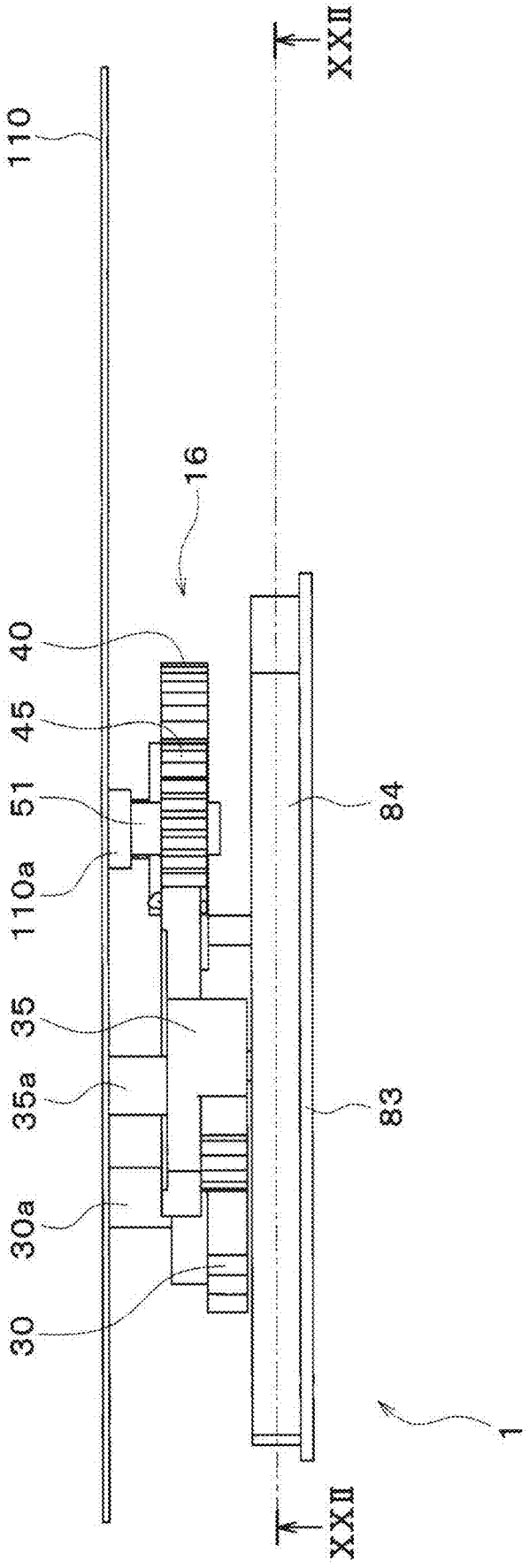


FIG. 21

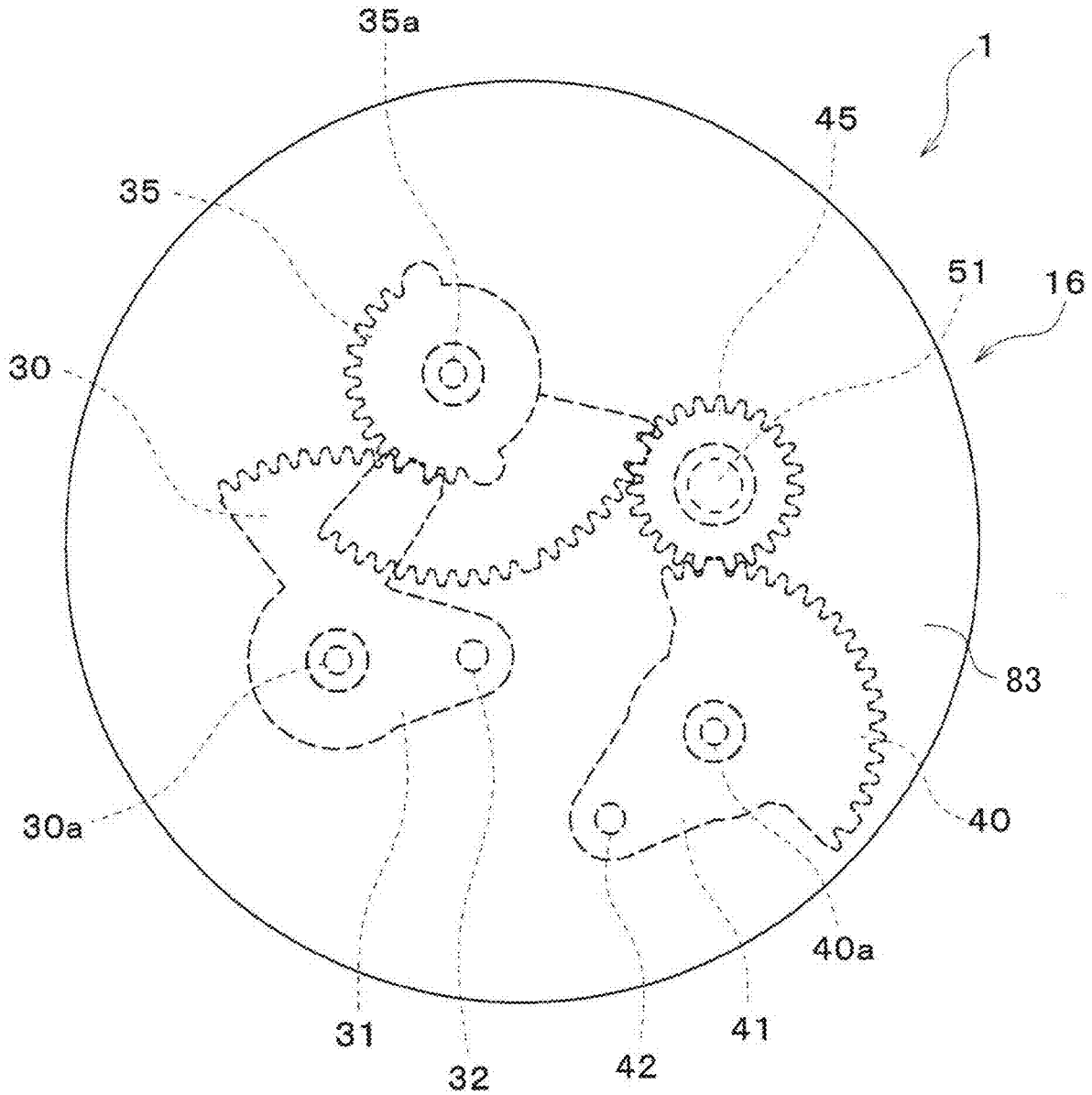


FIG. 22

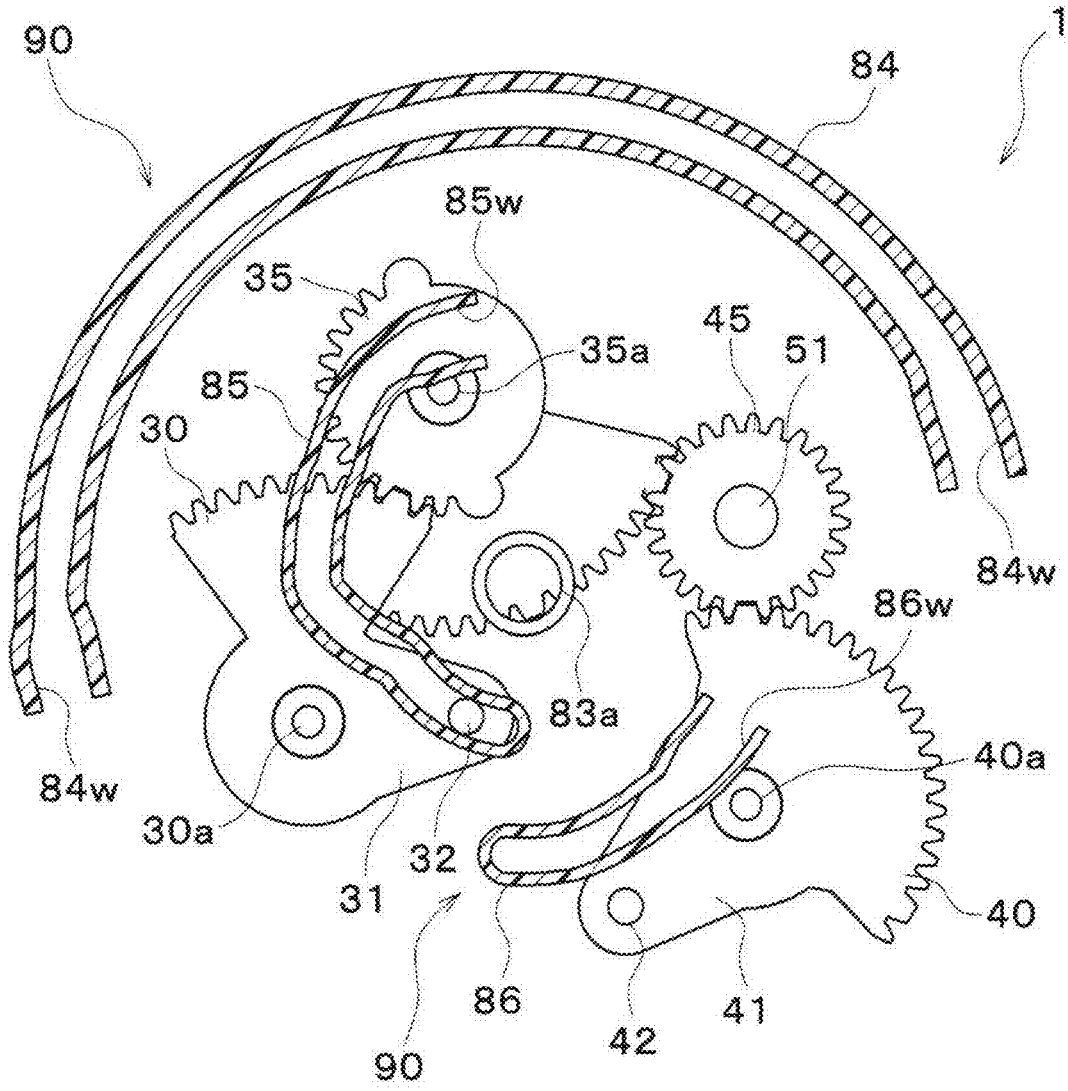

90
1
84
85w
35
35a
45
51
85
30
84w
86w
83a
40a
84w
30a
32
31
40
86
42
41
90

FIG. 23

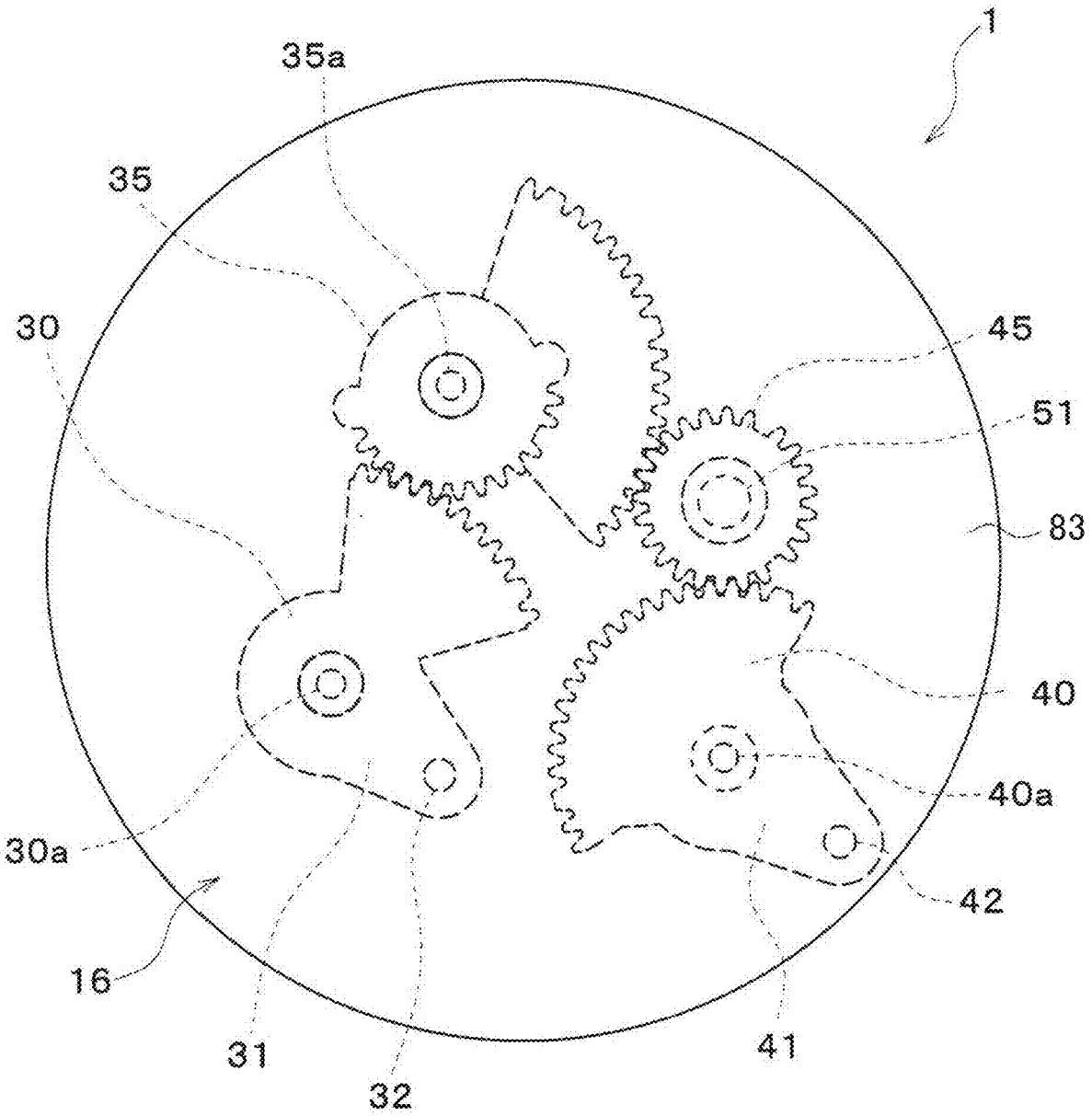


FIG. 24

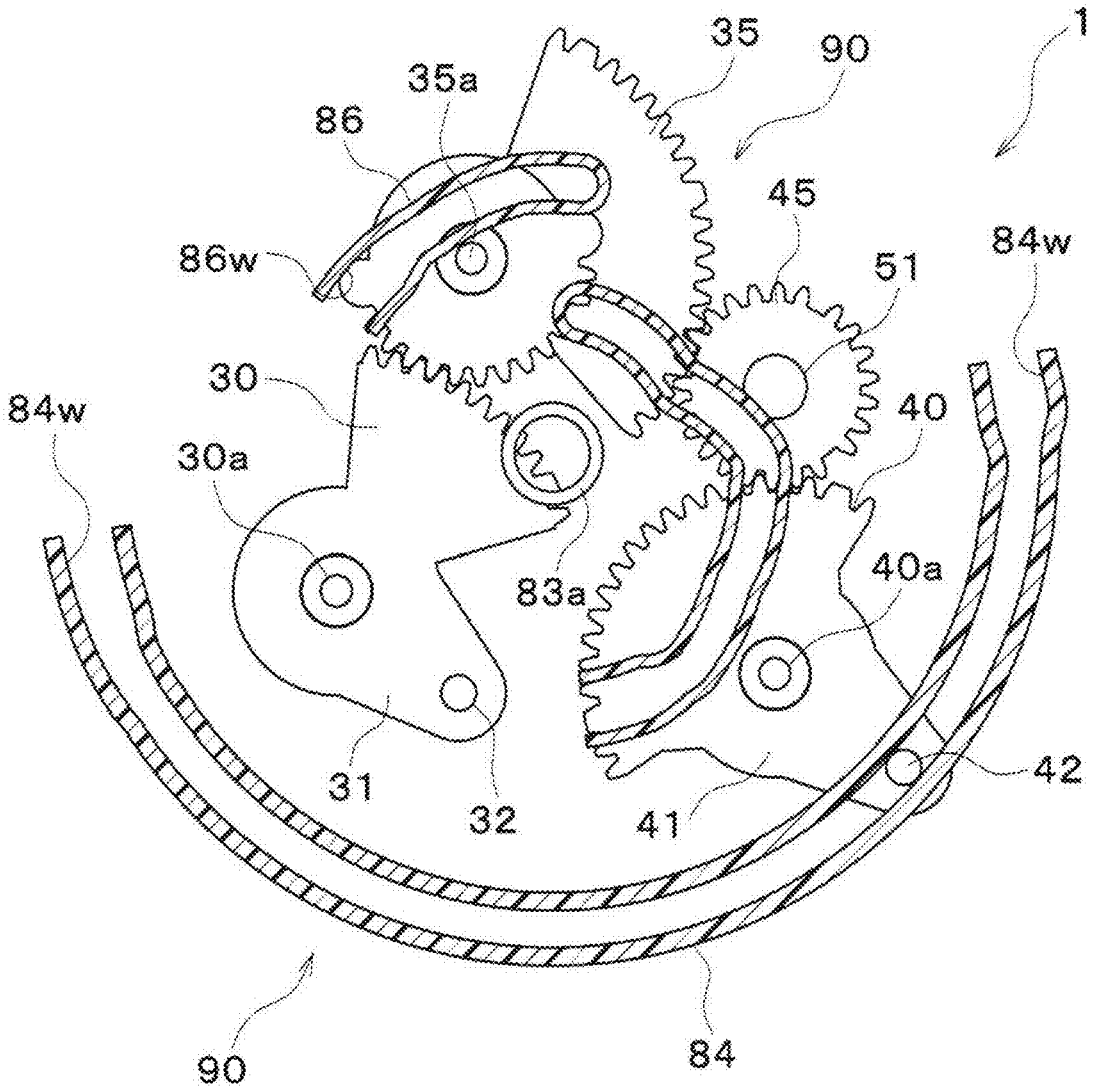


FIG. 25

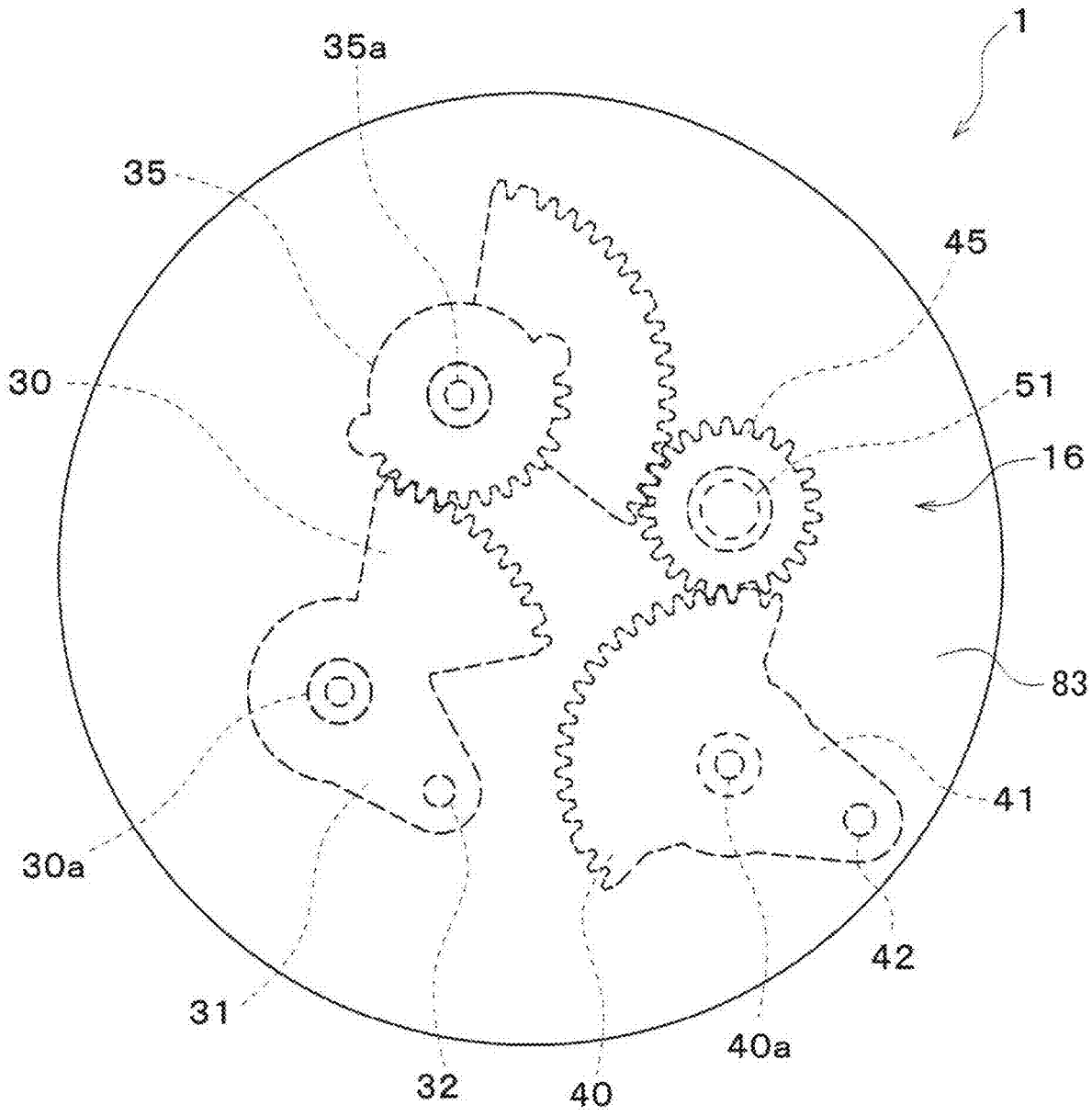


FIG. 26

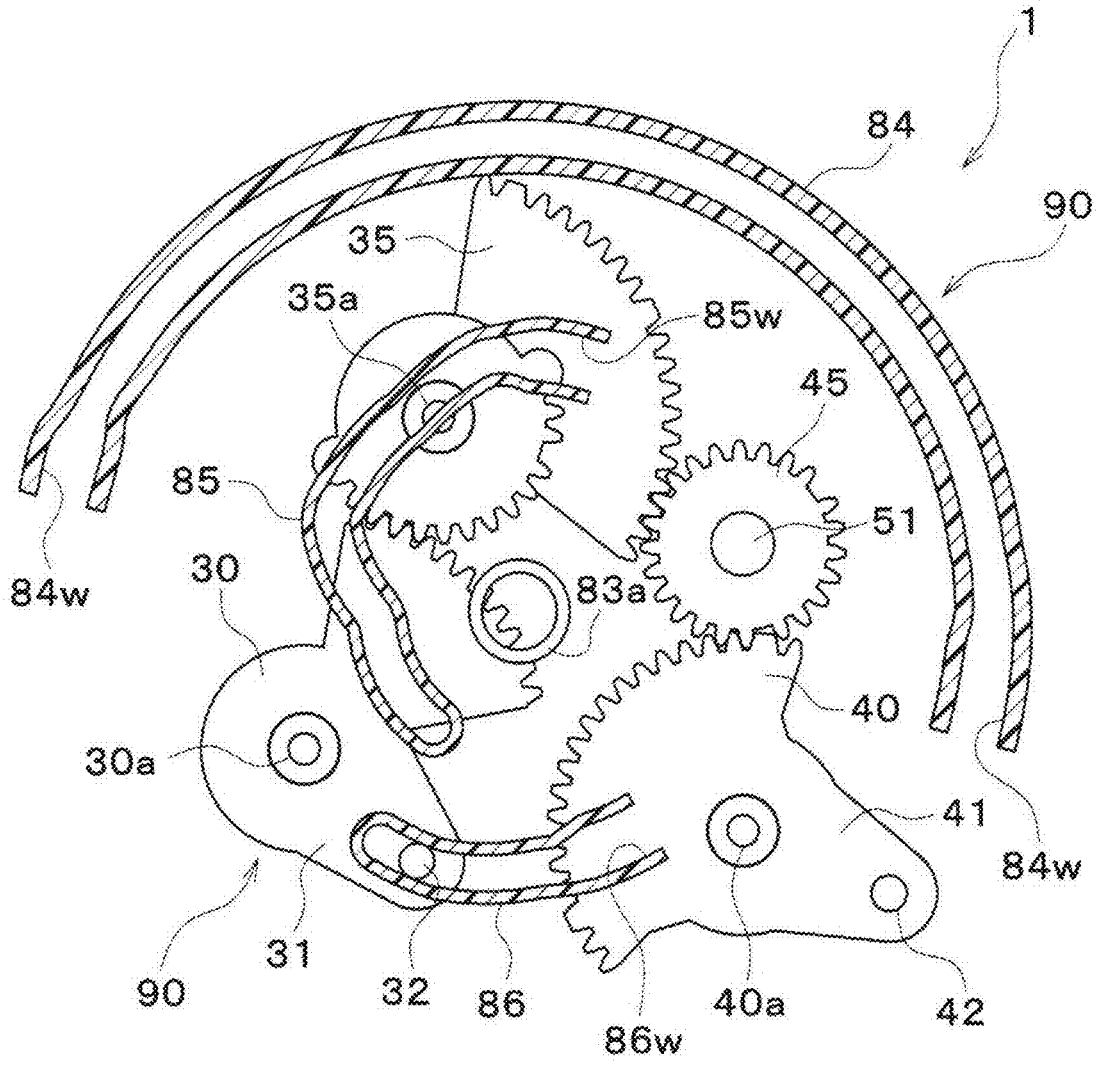
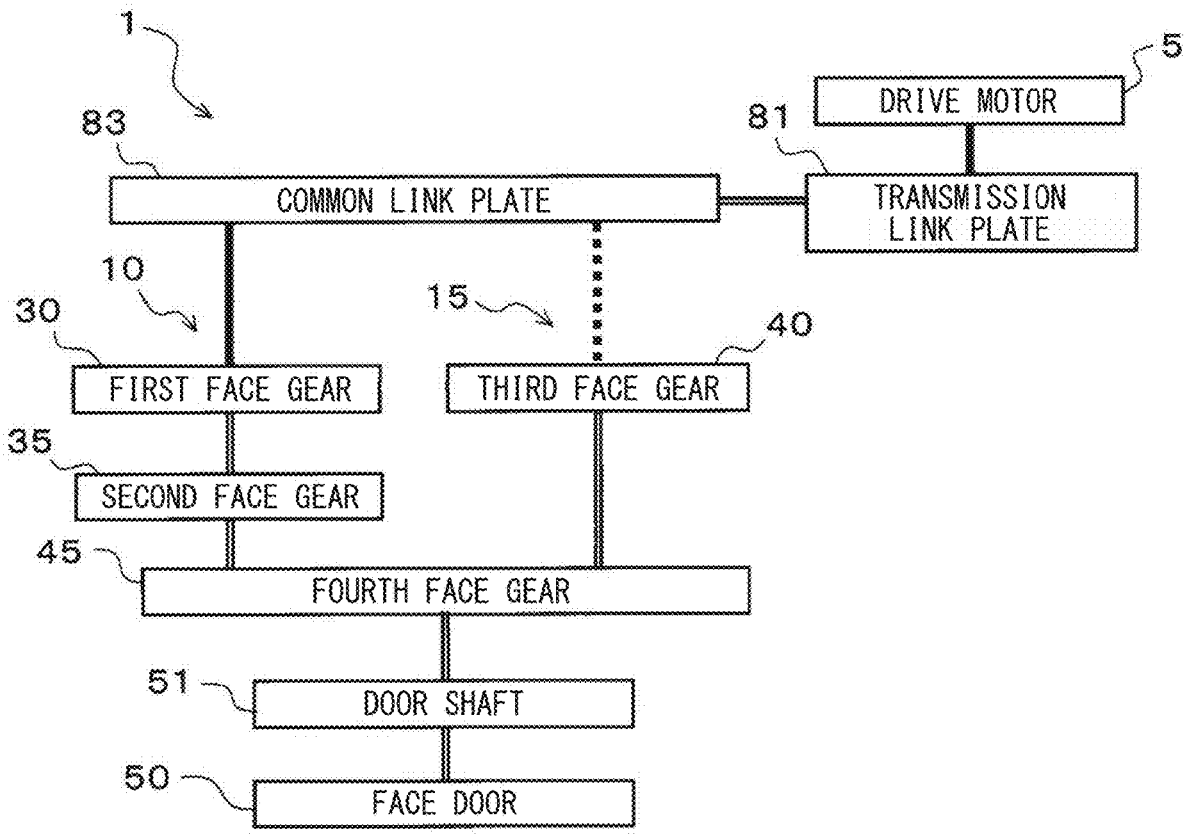

1
84
90
35
35a
85w
45
85
51
84w
30
83a
40
30a
41
84w
90
31
32
86
86w
40a
42

FIG. 27


1
5
DRIVE MOTOR
83
81
COMMON LINK PLATE
TRANSMISSION LINK PLATE
10
15
30
40
FIRST FACE GEAR
THIRD FACE GEAR
35
SECOND FACE GEAR
45
FOURTH FACE GEAR
51
DOOR SHAFT
50
FACE DOOR

LINK MECHANISM

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation application of International Patent Application No. PCT/JP2022/038520 filed on Oct. 17, 2022, which designated the U.S. and claims the benefit of priority from Japanese Patent Application No. 2021-180954 filed on Nov. 5, 2021. The entire disclosures of all of the above applications are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to a link mechanism that is configured to transmit a drive force, which is generated by a drive device, to a driven member.

BACKGROUND

[0003] Previously, in a vehicle air conditioning apparatus, a door (serving as a driven member) is moved by transmitting a drive force, which is generated by a drive device (e.g., a servomotor), to the door to adjust an opening degree of an air passage. There has been proposed a link mechanism used in such a vehicle air conditioning apparatus.

[0004] The previously proposed link mechanism is applied to the vehicle air conditioning apparatus, and thereby a plurality of doors of the vehicle air conditioning apparatus are driven by a single servomotor (i.e., only one servomotor). In this way, the number of servomotors can be reduced, and thereby the costs of the vehicle air conditioning apparatus can be reduced.

SUMMARY

[0005] This section provides a general summary of the disclosure, and is not a comprehensive disclosure of its full scope or all of its features.

[0006] According to the present disclosure, there is provided a link mechanism that includes a drive device, a driven member, a first drive force transmission mechanism, a second drive force transmission mechanism and a transmission path switch device. The drive device is configured to generate a drive force. The driven member is configured to be moved by an action of the drive force generated by the drive device. The first drive force transmission mechanism is configured to transmit the drive force, which is generated by the drive device, to the driven member at a speed reduction ratio which is predetermined. The second drive force transmission mechanism is configured to transmit the drive force, which is generated by the drive device, to the driven member at a speed reduction ratio which is different from the speed reduction ratio of the first drive force transmission mechanism. The transmission path switch device is configured to switch a transmission path, along which the drive force is transmitted from the drive device toward the driven member, to one of the first drive force transmission mechanism and the second drive force transmission mechanism.

BRIEF DESCRIPTION OF DRAWINGS

[0007] The drawings described herein are for illustrative purposes only of selected embodiments and not all possible implementations, and are not intended to limit the scope of the present disclosure.

[0008] FIG. **1** is a cross-sectional view of a vehicle air conditioning apparatus that includes a link mechanism according to a first embodiment.

[0009] FIG. **2** is an explanatory diagram showing a normal drive mode of the link mechanism of the first embodiment.

[0010] FIG. **3** is an explanatory diagram showing a high precision drive mode of the link mechanism of the first embodiment.

[0011] FIG. **4** is a top view of the link mechanism of the first embodiment when the link mechanism is in a face mode.

[0012] FIG. **5** is an explanatory diagram showing mechanism components in a case where the link mechanism of the first embodiment is in the face mode.

[0013] FIG. **6** is a cross-sectional view taken along line VI-VI in FIG. **4**.

[0014] FIG. **7** is an explanatory diagram showing the mechanism components in a case where the link mechanism of the first embodiment is in a foot mode.

[0015] FIG. **8** is an explanatory diagram showing arrangement of link grooves and link pins in the case where the link mechanism of the first embodiment is in the foot mode.

[0016] FIG. **9** is an explanatory diagram showing arrangement of the mechanism components in a case where the link mechanism of the first embodiment is in a defroster mode.

[0017] FIG. **10** is an explanatory diagram showing arrangement of the link grooves and the link pins in the case where the link mechanism of the first embodiment is in the defroster mode.

[0018] FIG. **11** is an explanatory diagram showing a relationship among drive modes and blowout modes of the link mechanism of the first embodiment.

[0019] FIG. **12** is an explanatory diagram showing a first state at a mode shift time of the link mechanism of the first embodiment.

[0020] FIG. **13** is an explanatory diagram showing a second state at the mode shift time of the link mechanism of the first embodiment.

[0021] FIG. **14** is an explanatory diagram showing a third state at the mode shift time of the link mechanism of the first embodiment.

[0022] FIG. **15** is an explanatory diagram showing a fourth state at the mode shift time of the link mechanism of the first embodiment.

[0023] FIG. **16** is a schematic diagram showing a structure of a link mechanism of a second embodiment.

[0024] FIG. **17** is a schematic diagram showing a structure of a link mechanism of a third embodiment.

[0025] FIG. **18** is a schematic diagram showing a structure of a link mechanism of a fourth embodiment.

[0026] FIG. **19** is a schematic diagram showing a structure of a link mechanism of a fifth embodiment.

[0027] FIG. **20** is a top view of the link mechanism of the fifth embodiment when the link mechanism is in the face mode.

[0028] FIG. **21** is an explanatory diagram showing mechanism components in a case where the link mechanism of the fifth embodiment is in the face mode.

[0029] FIG. **22** is a cross-sectional view taken along line XXII-XXII n FIG. **20**.

[0030] FIG. **23** is an explanatory diagram showing the mechanism components in a case where the link mechanism of the fifth embodiment is in the foot mode.

[0031] FIG. **24** is an explanatory diagram showing arrangement of link grooves and link pins in a case where the link mechanism of the fifth embodiment is in the foot mode.

[0032] FIG. **25** is an explanatory diagram showing arrangement of the mechanism components in a case where the link mechanism of the fifth embodiment is in the defroster mode.

[0033] FIG. **26** is an explanatory diagram showing arrangement of link grooves and link pins in a case where the link mechanism of the fifth embodiment is in the defroster mode.

[0034] FIG. **27** is a schematic diagram showing a structure of a link mechanism of a sixth embodiment.

DETAILED DESCRIPTION

[0035] Previously, in a vehicle air conditioning apparatus, a door (serving as a driven member) is moved by transmitting a drive force, which is generated by a drive device (e.g., a servomotor), to the door to adjust an opening degree of an air passage. There has been proposed a link mechanism used in such a vehicle air conditioning apparatus.

[0036] The previously proposed link mechanism is applied to the vehicle air conditioning apparatus, and thereby a plurality of doors of the vehicle air conditioning apparatus are driven by a single servomotor (i.e., only one servomotor). In this way, the number of servomotors can be reduced, and thereby the costs of the vehicle air conditioning apparatus can be reduced.

[0037] Here, the plurality of doors are moved by the drive force of the single drive device. Therefore, a transmission mechanism for transmitting the drive force becomes complicated, and thereby an influence of tolerances of components of the transmission mechanism is increased to possibly cause a deterioration in the precision with respect to the movement of the driven member. Since the movement of the driven member is executed in the low precision state, there may be a case where the movement of the driven member may not be appropriate for some cases. Furthermore, since the number of the components of the transmission mechanism is increased, it is difficult to meet the demand for downsizing the vehicle air conditioning apparatus.

[0038] According to one aspect of the present disclosure, there is provided a link mechanism that includes a drive device, a driven member, a first drive force transmission mechanism, a second drive force transmission mechanism and a transmission path switch device. The drive device is configured to generate a drive force. The driven member is configured to be moved by an action of the drive force generated by the drive device. The first drive force transmission mechanism is configured to transmit the drive force, which is generated by the drive device, to the driven member at a speed reduction ratio which is predetermined. The second drive force transmission mechanism is configured to transmit the drive force, which is generated by the drive device, to the driven member at a speed reduction ratio which is different from the speed reduction ratio of the first drive force transmission mechanism. The transmission path switch device is configured to switch a transmission path, along which the drive force is transmitted from the drive device toward the driven member, to one of the first drive force transmission mechanism and the second drive force transmission mechanism.

[0039] According to the link mechanism described above, the transmission path switch device can switch the transmission path, which transmits the drive force from the drive device toward the driven member, to one of the transmission path through the first drive force transmission mechanism and the transmission path through the second drive force transmission mechanism. The first drive force transmission mechanism and the second drive force transmission mechanism are configured to transmit the drive force to the driven member at the different speed reduction ratios, respectively. Therefore, the link mechanism can realize the two different modes as the moving modes (e.g., the modes for implementing the two different amounts of movement) of the driven member realized by the action of the drive force. As a result, the link mechanism can move the driven member by the appropriate amount of movement according to the scene by using the two different moving modes.

[0040] Hereinafter, embodiments of the present disclosure will be described with reference to the drawings. In each of the following embodiments, the same reference signs may be assigned to portions that are the same as or equivalent to those described in the preceding embodiment(s), and the description thereof may be omitted. Further, when only a portion of any one of the components is described in the embodiment, the description of the rest of the components described in the preceding embodiment may be applied to the rest of the components. In addition to the combinations of portions that are specifically shown to be combinable in the respective embodiments, it is also possible to partially combine the embodiments even if they are not specifically shown, provided that the combinations are not impeded.

First Embodiment

[0041] A first embodiment of the present disclosure will be described with reference to the drawings. In the first embodiment, a link mechanism **1** of the present disclosure is used as a mechanism that moves a plurality of doors (including a face door **50**) of a vehicle air conditioning apparatus **100**.

[0042] First of all, a structure of the vehicle air conditioning apparatus **100**, to which the link mechanism **1** is applied, will be described with reference to the drawings. FIG. **1** is a cross-sectional view of the vehicle air conditioning apparatus **100** of the first embodiment. Arrows, which face an up-side (up) and a down-side (down), respectively, in FIG. **1**, indicate an up-to-down direction in an installed state where the vehicle air conditioning apparatus **100** is installed on the vehicle. Arrows, which face a front side (front) and a rear side (rear), respectively, in FIG. **1**, indicate a front-to-rear direction in the installed state. Furthermore, a front side and a back side of a plane of FIG. **1** indicate a left-to-right direction of the vehicle air conditioning apparatus **100** in the installed state.

[0043] The vehicle air conditioning apparatus **100** of the first embodiment is placed at a location that is on a lower side of an instrument panel in a cabin (serving as an air conditioning subject space) of the vehicle to air condition the cabin. The vehicle air conditioning apparatus **100** includes a cabin air conditioning unit **105** that is configured to supply conditioning air, the temperature of which is adjusted by a refrigeration cycle.

[0044] The cabin air conditioning unit **105** cooperates with a blower unit to form a ventilation system of the vehicle air conditioning apparatus **100** and is placed generally at a center in the left-to-right direction of the vehicle at the

location that is on the lower side of the instrument panel in the cabin. The blower unit is offset from the center toward a front passenger seat side at the location which is on the lower side of the instrument panel in the cabin. The blower unit includes an inside/outside air switching box and a blower. The blower is configured to suction the air through the inside/outside air switching box and discharges the suctioned air.

[0045] The inside/outside air switching box has: an outside air inlet, which introduces the outside air (i.e., the air outside the cabin); and an inside air inlet, which introduces the inside air (i.e., the air inside the cabin). The outside air inlet and the inside air inlet are opened and closed by an inside/outside air switching door which is driven by an electric actuator.

[0046] Furthermore, the blower of the blower unit includes a centrifugal fan, a drive electric motor (or simply referred to as a drive motor) and a scroll case. More specifically, the blower includes two sets of centrifugal fans and two sets of scroll cases. The blower unit can switch its operation mode among: an outside air mode for blowing only the outside air; an inside air mode for blowing only the inside air; and an inside/outside air two-layer mode for blowing the outside air and the inside air.

[0047] In the vehicle air conditioning apparatus **100**, an evaporator **115** (i.e., a cooling heat exchanger) and a heater core **120** (i.e., a heating heat exchanger) are received in a common air conditioning case **110**. The air conditioning case **110** is a molded article made of a resin material (e.g., polypropylene) which has a certain degree of resiliency and high strength.

[0048] Specifically, the air conditioning case **110** includes a plurality of separate cases which are formed separately. These separate cases are joined together by fasteners (e.g., metal spring clips and/or screws) after receiving the evaporator **115** and the heater core **120** at the inside of the separate cases. Thereby, the separate cases form a part of the cabin air conditioning unit **105** of the vehicle air conditioning apparatus **100**.

[0049] Two air inlets (not shown) are formed at sides of a front end portion of the air conditioning case **110** that is closest to the vehicle font side. These air inlets correspond to the two scroll cases, respectively, of the blower unit. Specifically, at the time of the outside air mode, the outside air flows into the two air inlets. At the time of the inside air mode, the inside air flows into the two air inlets. At the time of the inside/outside air two-layer mode, the outside air flows into one of the two air inlets from one of the scroll cases, and the inside air flows into the other one of the two air inlets from the other one of the two scroll cases.

[0050] As shown in FIG. **1**, a partition plate **111** extends through the entire extent of the inside of the air conditioning case **110** in the left-to-right direction of the vehicle. The partition plate **111** is molded integrally with the air conditioning case **110** and partitions an air passage **121** of the air conditioning case **110** into two air passages (upper and lower air passages) in the up-to-down direction of the vehicle.

[0051] The upper air passage, which is located on the upper side of the partition plate **111**, conducts the air, which flows from the one of the two air inlets. The lower air passage, which is located on the lower side of the partition plate **111**, conducts the air, which flows from the other one of the two air inlets. In the case of the inside/outside air two-layer mode, the outside air is conducted through the upper side air passage located on the upper side of the partition plate **111**, and the inside air is conducted through the lower air passage located on the lower side of the partition plate **111**.

[0052] The evaporator **115** is placed at a location immediately after the air inlets in the flow direction of the air in the inside of the air conditioning case **110**. The evaporator **115** extends generally in parallel with the up-to-down direction of the vehicle through the entire extent of the inside of the air conditioning case **110** in the up-to-down direction of the vehicle. Although not depicted in the drawing, a width dimension of the evaporator **115** in the left-to-right direction of the vehicle is substantially the same as a width dimension of the air conditioning case **110** in the left-to-right direction.

[0053] The evaporator **115** is the cooling heat exchanger that absorbs heat from the conditioning air (i.e., the air for conditioning the cabin) as latent heat of evaporation of a refrigerant in the refrigeration cycle of the vehicle air conditioning apparatus **100** and thereby cools the conditioning air. The evaporator **115** is arranged to extend through a through-hole formed through the partition plate **111**.

[0054] Therefore, an upper portion of the evaporator **115** is placed in the upper air passage located on the upper side of the partition plate **111**, and a lower portion of the evaporator **115** is placed in the lower air passage located on the lower side of the partition plate **111**. Therefore, the upper portion of the evaporator **115** can cool the air, which flows in the upper air passage located on the upper side of the partition plate **111**, and the lower portion of the evaporator **115** can cool the air, which flows in the lower air passage located on the lower side of the partition plate **111**.

[0055] The heater core **120** is placed on the downstream side (i.e., the vehicle rear side) of the evaporator **115** in the flow direction of the air and is spaced from the evaporator **115** by a predetermined distance. Although not depicted in the drawing, a width dimension of the heater core **120** in the left-to-right direction of the vehicle is substantially the same as the width dimension of the air conditioning case **110** in the left-to-right direction.

[0056] The heater core **120** is the heating heat exchanger that heats the blown air which has passed through the evaporator **115** and is thereby cooled. The heater core **120** includes: a plurality of tubes (e.g., flat tubes), through which a heat medium having a high temperature (e.g., a heat medium in a high-temperature side heat medium circuit, or an engine coolant) flows; and a plurality of corrugated fins, which are joined to the tubes.

[0057] As shown in FIG. **1**, the heater core **120** is arranged to extend through a through-hole formed through the partition plate **111**. Therefore, an upper portion of the heater core **120** is placed in the upper air passage located on the upper side of the partition plate **111**, and a lower portion of the heater core **120** is placed in the lower air passage located on the lower side of the partition plate **111**. Thus, the upper portion of the heater core **120** can heat the air, which flows in the upper air passage located on the upper side of the partition plate **111**, and the lower portion of the heater core **120** can heat the air, which flows in the lower air passage located on the lower side of the partition plate **111**.

[0058] A low-temperature air bypass passage **122** is formed on the upper side of the heater core **120** in the upper air passage located on the upper side of the partition plate **111**. The low-temperature air bypass passage **122** is a passage through which the air cooled by the upper portion of

the evaporator **115** flows while bypassing the heater core **120**. Since the low-temperature air bypass passage **122** bypasses the heater core **120**, the air, which has passed through the upper portion of the evaporator **115**, remains cold and flows to the downstream side.

[0059] Another low-temperature air bypass passage **122** is formed on the lower side of the heater core **120** in the lower air passage located on the lower side of the partition plate **111**. On the lower side of the partition plate **111**, the low-temperature air bypass passage **122** is a passage through which the air cooled by the lower portion of the evaporator **115** flows while bypassing the heater core **120**. Since this low-temperature air bypass passage **122** bypasses the heater core **120**, the air, which has passed through the lower portion of the evaporator **115**, remains cold and flows to the downstream side.

[0060] At an upper portion of the air conditioning case **110**, an air mix door **125** is placed between the evaporator **115** and the heater core **120**. The air mix door **125** is a sliding door that is configured to be slid generally in parallel to a front surface of the heater core **120**. Although not depicted in the drawing, the air mix door **125** includes: a door main body, which is shaped in a plate form; and two racks which are formed integrally with the door main body.

[0061] Two opposite end portions (i.e., two end portions which are opposite to each other in the direction perpendicular to the plane of FIG. **1**) of the door main body of the air mix door **125** are inserted in two guide grooves, respectively, which are respectively formed at the sides of the air conditioning case **110**. The guide grooves are respectively formed by two opposed walls which inwardly project from the sides of the air conditioning case **110**. The guide grooves extend generally in parallel with an air inlet surface of the heater core **120** generally in the up-to-down direction. The guide grooves have a function of guiding an operating direction (i.e., a sliding direction) of the air mix door **125** generally in parallel with the air inlet surface of the heater core **120** generally in the up-to-down direction.

[0062] The racks of the air mix door **125** are respectively meshed with two pinions which are formed at a shaft **125***a*. The shaft **125***a* extends in the left-to-right direction of the vehicle (the direction perpendicular to the plane of FIG. **1**) and is rotatably supported by the sides of the air conditioning case **110**. One end portion of the shaft **125***a* extends through a side wall of the air conditioning case **110** and is coupled with an electric actuator (not shown).

[0063] Therefore, when the shaft **125***a* is rotated by the electric actuator, a rotational motion of the shaft **125***a* is converted into a slide motion of the air mix door **125**. Thereby, a slide position of the air mix door **125** on the upper side of the partition plate **111** is adjusted.

[0064] On the upper side of the partition plate **111**, a high-temperature air passage **123** is formed on the downstream side (the vehicle rear side) of the heater core **120** in the flow direction of the blown air. The high-temperature air passage **123** is an air passage that conducts the high-temperature air which is heated by the heater core **120**. Furthermore, on the upper side of the partition plate **111**, an air mixing portion **124** is formed on the downstream side of the low-temperature air bypass passage **122** and the high-temperature air passage **123** in the flow direction of the air. The high-temperature air, which is conducted in the high-temperature air passage **123**, and the low-temperature air, which is conducted in the low-temperature air bypass passage **122**, are mixed in the air mixing portion **124**.

[0065] As described above, by adjusting the slide position of the air mix door **125**, the air mix door **125** can adjust an air flow rate ratio between a flow rate of the high-temperature air, which is heated by the upper portion of the heater core **120**, and a flow rate of the low-temperature air, which is conducted through the low-temperature air bypass passage **122** while bypassing the upper portion of the heater core **120**. The high-temperature air, which is discharged from the upper portion of the heater core **120**, and the low-temperature air, which is conducted in the low-temperature air bypass passage **122**, merge with each other in the air mixing portion **124** located on the upper side of the partition plate **111**, and thereby, the air, which has a desired temperature, can be formed at the air mixing portion **124**.

[0066] Here, as shown in FIG. **1**, another air mix door **125** is placed between the evaporator **115** and the heater core **120** on the lower side of the partition plate **111**. The air mix door **125** on the lower side of the partition plate **111** is also a slide door that is configured to be slid in a predetermined direction on the front side of the heater core **120**, and this air mix door **125** includes: a door main body, which is shaped in a plate form; and two racks which are formed integrally with the door main body. Specifically, the air mix door **125** on the lower side of the partition plate **111** is slidably formed with the structure, which is the same as that of the air mix door **125** on the upper side of the partition plate **111**.

[0067] On the lower side of the partition plate **111**, another high-temperature air passage **123** is formed on the downstream side of the heater core **120** in the flow direction of the blown air. The high-temperature air passage **123** is an air passage that conducts the high-temperature air which is heated by the heater core **120**. Furthermore, on the lower side of the partition plate **111**, another air mixing portion **124** is formed on the downstream side of the low-temperature air bypass passage **122** and the high-temperature air passage **123** in the flow direction of the blown air. The high-temperature air, which is conducted in the high-temperature air passage **123**, and the low-temperature air, which is conducted in the low-temperature air bypass passage **122**, are mixed in the air mixing portion **124**.

[0068] Thus, even on the lower side of the partition plate **111**, by adjusting the slide position of the air mix door **125**, the air mix door **125** can adjust an air flow rate ratio between a flow rate of the high-temperature air, which is heated by the lower portion of the heater core **120**, and a flow rate of the low-temperature air, which is conducted through the low-temperature air bypass passage **122** while bypassing the lower portion of the heater core **120**. The high-temperature air, which is discharged from the lower portion of the heater core **120**, and the low-temperature air, which is conducted in the low-temperature air bypass passage **122**, merge with each other in the air mixing portion **124** located on the lower side of the partition plate **111**, and thereby, the air, which has a desired temperature, can be formed at the air mixing portion **124**.

[0069] Furthermore, as shown in FIG. **1**, a defroster opening **160** is formed at a location adjacent to the upper air mixing portion **124** at the air conditioning case **110**. The defroster opening **160** is connected to defroster outlets through a defroster duct (not shown), and the conditioning air, which is appropriately adjusted, flows from the air mixing portion **124** into the defroster opening **160**. The

conditioning air, which is outputted from the defroster opening **160**, is discharged against an inner surface of the vehicle front window glass through the defroster outlets.

[0070] A defroster door **60** is placed at the defroster opening **160**. The defroster door **60** can be moved by a drive force transmitted from a drive motor (a single drive electric motor) **5** to adjust an opening cross-sectional area of the defroster opening **160**. The link mechanism **1** of the present disclosure is used for the transmission of the drive force to the defroster door **60**.

[0071] A face opening **150** opens at an upper portion of the air conditioning case **110** at a location which is on the vehicle rear side of the defroster opening **160**. The face outlet is connected to face outlets placed on the upper side of the instrument panel through a face duct, and the conditioning air, which is appropriately adjusted, flows from the air mixing portion **124** into the face opening **150**. The conditioning air, which is outputted from the face opening **150**, is discharged toward a head of an occupant(s) seated on a front seat(s) in the cabin through the face outlets.

[0072] A face door **50**, which is formed as a slide door, is installed to the face opening **150**. The face door **50** includes: a door main body, which is shaped in a plate form; and two racks which are formed integrally with the door main body. The face door **50** is installed such that the face door **50** is slid along two guide grooves formed along an opening edge of the face opening **150**. The face door **50** can reciprocate at the opening edge of the face opening **150** along a moving path defined by the guide grooves.

[0073] The racks of the face door **50** are respectively meshed with two pinions which are formed at a door shaft **51**, thereby forming a rack and pinion. The door shaft **51** extends in the left-to-right direction of the vehicle and is rotatably supported by the sides of the air conditioning case **110**. One end portion of the door shaft **51** extends through a shaft hole **110***a* formed through the side wall of the air conditioning case **110** and is placed at the outside of the air conditioning case **110**.

[0074] The link mechanism **1**, which is indicated by a dotted line in FIG. **1**, is placed at the outside of the air conditioning case **110**. The link mechanism **1** is configured to transmit the drive force of the drive motor **5** of the link mechanism **1** to the door shaft **51**. A specific structure of the link mechanism **1** will be described later in detail.

[0075] Thus, when the drive force is transmitted to the door shaft **51** through the link mechanism **1**, the rotational motion of the door shaft **51** is converted into the slide motion of the face door **50** to adjust the slide position of the face door **50** at any position along the guide grooves. The face door **50** is an example of a driven member of the present disclosure. Furthermore, the face door **50** can be urged against a seal surface formed at the air conditioning case **110** by a pressure of the air flow to seal the passage.

[0076] Furthermore, two foot openings **170** are opened at a rear portion of the air conditioning case **110** located on the vehicle rear side such that the foot openings **170** are placed adjacent to the air mixing portion **124** on the lower side of the partition plate **111**. Each of the foot openings **170** is an opening into which the conditioning air from the air mixing portion **124** on the lower side of the partition plate **111** flows after the adjustment of the conditioning air at the air mixing portion **124**, and the foot openings **170** open at the left side and the right side, respectively, of the air conditioning case **110**. The foot openings **170** can discharge the conditioning air to the feet of the occupant(s) on the front seat(s) through foot outlets which are provided for the front seat(s) and are arranged at the left side and the right side.

[0077] Two foot doors **70** are placed at opening edges, respectively, of the foot openings **170** at the inside of the air conditioning case **110**. The foot doors **70** are rotatably supported by a rotatable shaft, which extends in the left-to-right direction of the vehicle, and the foot doors **70** are coupled to the link mechanism **1** described later. Thus, when each of the foot doors **70** is rotated by the drive force transmitted through the link mechanism **1**, the foot door **70** opens or closes the corresponding foot opening **170**.

[0078] Here, as shown in FIG. **1**, the partition plate **111** extends to a rear wall surface of the air conditioning case **110** placed on the vehicle rear side and has a function of partitioning between the air mixing portion **124** placed on the upper side of the partition plate **111** and the air mixing portion **124** placed on the lower side of the partition plate **111**. A communication opening **180** is formed at a rear end portion of the partition plate **111**, which is placed on the vehicle rear side, to communicate between the air mixing portion **124** placed on the upper side of the partition plate **111** and the air mixing portion **124** placed on the lower side of the partition plate **111**.

[0079] A communication opening door **80** is placed at an opening edge of the communication opening **180**. The communication opening door **80** is rotatably supported by a rotatable shaft, which extends in the left-to-right direction of the vehicle, and the communication opening door **80** is coupled to the link mechanism **1** described later. Thus, when the communication opening door **80** is rotated by the drive force transmitted through the link mechanism **1**, the communication opening door **80** opens and closes the communication opening **180**.

[0080] Next, a structure of the link mechanism **1** of the first embodiment will be described with reference to FIGS. **2** to **5**. FIGS. **2** and **3** are schematic diagrams showing the structure of the link mechanism **1** of the first embodiment. In FIGS. **2** and **3**, transmission states of the drive force are indicated by different types of lines, each of which is drawn between corresponding two of a plurality of mechanism components **16** of the link mechanism **1**. At the structure where the drive force is transmitted through use of a corresponding link pin and a corresponding link groove, a state, in which the link pin and the link groove are in contact with each other, is indicated by a solid line, and another state, in which the link pin and the link groove are not in contact with each other, is indicated by a dotted line. Furthermore, a state, in which the gear portions of the mechanism components **16** are meshed with each other to transmit the drive force, is indicated by a double line.

[0081] The link mechanism **1** of the first embodiment is placed at the outer wall surface of the air conditioning case **110** at the vehicle air conditioning apparatus **100** and is configured to transmit the drive force generated by the drive motor **5** to the doors including the face door **50**. Specifically, the link mechanism **1** is configured to distribute and transmit the drive force generated by the drive motor **5** to four types of driven members, such as the face door **50**, the defroster door **60**, the foot doors **70** (hereinafter only one of the foot doors **70** will be described for the sake of simplicity), and the communication opening door **80**.

[0082] The vehicle air conditioning apparatus **100** controls these four types of doors through the link mechanism **1** to

implement a plurality of different types of blowout modes. These blowout modes include a face mode, a bilevel mode, a foot mode, a defroster mode and a foot/defroster mode.

[0083] The face mode is a discharge outlet mode for discharging the air toward an upper body of the occupant in the cabin from the face outlets by fully opening the face opening **150**. The bilevel mode is a discharge outlet mode for discharging the air toward the upper body and the feet of the occupant in the cabin by opening the face opening **150** and the foot opening **170**. The foot mode is a discharge outlet mode for discharging the air mainly from the foot outlets by fully opening the foot opening **170** and opening the defroster opening **160** at a small opening degree.

[0084] The defroster mode is a discharge outlet mode for discharging the air toward the inner surface of the front window glass by fully opening the defroster opening **160**. The foot/defroster mode is a discharge outlet mode for discharging the air from the foot outlets and the defroster outlets by opening the foot opening **170** and the defroster opening **160** at generally the equal opening degree.

[0085] As shown in FIGS. **2** and **3**, the link mechanism **1** of the first embodiment includes the mechanism components **16** for transmitting the drive force from the drive motor (serving as a drive power source) **5**. The drive motor **5** is a servomotor and generates the drive force based on a control signal received from a control device (the control device including at least one processor and at least one memory to execute a control program) of the vehicle air conditioning apparatus **100**.

[0086] The mechanism components **16** include a first link plate **20** and a second link plate **25**. The first link plate **20** is installed to a first plate support shaft **20***a* formed at the outside of the air conditioning case **110** and is rotated by the drive force generated by the drive motor **5**.

[0087] As shown in FIGS. **2** and **3**, a portion of the drive force generated by the drive motor **5** is transmitted to the foot door **70** and the communication opening door **80** through the first link plate **20**. Thus, in the vehicle air conditioning apparatus **100**, the opening and closing operation of each of the foot door **70** and the communication opening door **80** is performed through the link mechanism **1**.

[0088] As shown in FIGS. **4** to **6**, the first link plate **20** has a first link groove **21** which forms a part of the transmission path switch device **90** and is formed at a surface of the first link plate **20** that is opposed to the outer surface of the air conditioning case **110**. The first link groove **21** is in a form of a groove that extends along a semicircle centered on the first plate support shaft **20***a*, and two opposite end portions of the first link groove **21** are both opened. The first link groove **21** is formed such that a link pin **42** of a third face gear **40** described later can be inserted into the first link groove **21**. The drive force, which is transmitted to the first link plate **20**, can be transmitted to the third face gear **40** through contact of the link pin **42** to the first link groove **21** at the inside of the first link groove **21**.

[0089] The second link plate **25** is rotatably supported by a second plate support shaft **25***a* formed at the air conditioning case **110**, and the second link plate **25** is installed such that a gear portion (i.e., a portion having a plurality of gear teeth) of the second link plate **25** is meshed with a gear portion of the first link plate **20**. Thus, when the drive force is inputted to the first link plate **20**, the drive force is transmitted to the second link plate **25** through the gear portion of the first link plate **20** and the gear portion of the second link plate **25**, and thereby, the second link plate **25** is rotated about the second plate support shaft **25***a*.

[0090] As shown in FIGS. **2** and **3**, a portion of the drive force, which is transmitted from the first link plate **20**, is transmitted to the defroster door **60** through the second link plate **25**. Thus, in the vehicle air conditioning apparatus **100**, the opening and closing operation of the defroster door **60** is performed through the link mechanism **1**.

[0091] As shown in FIGS. **4** to **6**, the second link plate **25** has a second link groove **26** and a third link groove **27** which form a part of the transmission path switch device **90** and are formed at a surface of the second link plate **25** that is opposed to the outer surface of the air conditioning case **110**. The second link groove **26** is in a form of a groove that extends along a semicircle centered on the second plate support shaft **25***a*, and one of two opposite end portions of the second link groove **26** is opened, and the other one of the two opposite end portions of the second link groove **26** is closed. Like the second link groove **26**, the third link groove **27** is in a form of a groove that extends along a semicircle centered on the second plate support shaft **25***a*, and one of two opposite end portions of the third link groove **27** is opened, and the other one of the opposite end portions of the third link groove **27** is closed.

[0092] Each of the second link groove **26** and the third link groove **27** is formed such that a link pin **32** of a first face gear **30** described later can be inserted into each of the second link groove **26** and the third link groove **27**. The drive force, which is transmitted to the second link plate **25**, can be transmitted to the first face gear **30** through contact of the link pin **32** to the second link groove **26** at the inside of the second link groove **26**. Also, the drive force, which is transmitted to the second link plate **25**, can be transmitted to the first face gear **30** through contact of the link pin **32** to the third link groove **27** at the inside of the third link groove **27**. As shown in FIG. **6**, the open end portion of the second link groove **26** and the open end portion of the third link groove **27** are spaced from each other by a distance and are opposed to each other. Therefore, the link pin **32**, which is moved from the inside to the outside of one of the second link groove **26** and the third link groove **27**, is moved a predetermined distance and is then moved into the inside of the other one of the second link groove **26** and the third link groove **27**.

[0093] Furthermore, the link mechanism **1** of the first embodiment includes a first drive force transmission mechanism **10** and a second drive force transmission mechanism **15** for transmitting the drive force of the drive motor **5** to the face door **50** to drive the face door **50**. Each of the first drive force transmission mechanism **10** and the second drive force transmission mechanism **15** includes the corresponding mechanism components **16** for transmitting the drive force.

[0094] Specifically, the first drive force transmission mechanism **10** and the second drive force transmission mechanism **15** include the first face gear **30**, the second face gear **35**, the third face gear **40** and the fourth face gear **45** as the mechanism components **16**.

[0095] The first face gear **30** is rotatably supported by a gear shaft **30***a* formed at the outer surface of the air conditioning case **110** and has a lever **31** and the link pin **32**. As shown in FIG. **5**, the lever **31** is placed at a corresponding position of the first face gear **30**, which is different from a

position of the gear portion of the first face gear **30**, and the lever **31** projects in a direction away from the gear shaft **30***a* of the first face gear **30**.

[0096] The link pin **32** is formed at a distal end portion of the lever **31** at the first face gear **30**. The link pin **32** extends toward the second link plate **25** and is configured to be inserted into the inside of the second link groove **26** and the inside of the third link groove **27**. Thus, the drive force is transmitted from the second link plate **25** to the first face gear **30** by contacting the second link groove **26** or the third link groove **27** to the link pin **32**, and thereby the first face gear **30** is rotated about the gear shaft **30***a*.

[0097] The second face gear **35** is configured to be rotated about a gear shaft **35***a* formed at the outer surface of the air conditioning case **110** and has two gear portions which are formed at two different locations, respectively. One of the two gear portions of the second face gear **35** is configured to mesh with the gear portion of the first face gear **30**. Thus, the second face gear **35** is rotated about the gear shaft **35***a* by the drive force transmitted from the first face gear **30**.

[0098] The other one of the two gear portions of the second face gear **35** is configured to mesh with the gear portion of the fourth face gear **45**. Therefore, the drive force, which is transmitted to the second face gear **35**, is transmitted to the fourth face gear **45**.

[0099] The third face gear **40** is rotatably supported by a gear shaft **40***a* formed at the outer surface of the air conditioning case **110** and has a lever **41** and the link pin **42**. As shown in FIG. **5**, the lever **41** is placed at a corresponding position of the third face gear **40**, which is different from a position of the gear portion of the third face gear **40**, and the lever **41** projects in a direction away from the gear shaft **40***a* of the third face gear **40**.

[0100] The link pin **42** is formed at a distal end portion of the lever **41** at the third face gear **40**. The link pin **42** extends toward the first link plate **20** and is configured to be inserted into the inside of the first link groove **21**. Thus, the drive force is transmitted from the first link plate **20** to the third face gear **40** by contacting the first link groove **21** to the link pin **42**, and thereby the third face gear **40** is rotated about the gear shaft **40***a*.

[0101] The gear portion of the third face gear **40** is configured to mesh with the gear portion of the fourth face gear **45**. Therefore, the drive force, which is transmitted to the third face gear **40**, is transmitted to the fourth face gear **45**.

[0102] The fourth face gear **45** is installed to the end portion of the door shaft **51** which extends through the shaft hole **110***a*, and the fourth face gear **45** is configured to be rotated integrally with the door shaft **51**. As described above, the door shaft **51** is coupled through the shaft hole **110***a* to the rack and pinion placed at the inside of the air conditioning case **110**, and thereby, the rotational motion of the fourth face gear **45** and the door shaft **51** is converted into the slide movement of the face door **50**.

[0103] The link mechanism **1** configured in the above-described manner has two drive force transmission paths, i.e., the transmission path using the first drive force transmission mechanism **10** and the transmission path using the second drive force transmission mechanism **15** at the time of transmitting the drive force of the drive motor **5** to the face door **50**.

[0104] In the case of using the first drive force transmission mechanism **10**, the drive force is transmitted from the drive motor **5** through the first link plate **20**, the second link plate **25**, the first face gear **30**, the second face gear **35**, the fourth face gear **45**, the door shaft **51** and the face door **50** in this order.

[0105] In contrast, in the case of using the second drive force transmission mechanism **15**, the drive force is transmitted from the drive motor **5** through the first link plate **20**, the third face gear **40**, the fourth face gear **45**, the door shaft **51** and the face door **50** in this order.

[0106] Therefore, it can be understood that the number of the mechanism components **16**, which form the transmission path of the drive force, varies between the case of using the first drive force transmission mechanism **10** and the case of using the second drive force transmission mechanism **15**. Specifically, in the case of using the second drive force transmission mechanism **15**, the drive force is transmitted to the face door **50** through the mechanism components **16**, the number of which is smaller than the number of the mechanism components **16** used in the case of using the first drive force transmission mechanism **10**. Therefore, even under the influence of tolerances existing in the mechanism components **16**, the operation of the slide movement of the face door **50** can be controlled with higher precision by using the second drive force transmission mechanism **15** than by using the first drive force transmission mechanism **10**.

[0107] A gear ratio of the mechanism components **16** of the second drive force transmission mechanism **15** is set to be smaller than a gear ratio of the mechanism components **16** of the first drive force transmission mechanism **10**. Specifically, a gear ratio of the path from the first face gear **30** to the door shaft **51** through the second face gear **35** is set to be higher than a gear ratio of the path from the third face gear **40** to the door shaft **51**. Furthermore, a speed reduction ratio of the second drive force transmission mechanism **15** is set to be smaller than a speed reduction ratio of the first drive force transmission mechanism **10**.

[0108] Therefore, with respect to the amount of slide movement of the face door **50** using a predetermined drive force, the amount of slide movement of the face door **50** in the case of transmitting the drive force to the face door **50** using the second drive force transmission mechanism **15** is smaller than the amount of slide movement of the face door **50** in the case of transmitting the drive force to the face door **50** using the first drive force transmission mechanism **10**. Thus, in the case of transmitting the drive force through the second drive force transmission mechanism **15**, fine adjustment can be made with respect to the slide movement of the face door **50**, and thereby, the movement control of the face door **50** can be achieved with high stopping accuracy. In other words, in the case of transmitting the drive force by the first drive force transmission mechanism **10**, with respect to the slide movement of the face door **50**, the amount of movement relative to the inputted drive force can be made larger than the amount of movement relative to the inputted drive force in the case of transmitting the drive force by the second drive force transmission mechanism **15**.

[0109] Hereinafter, the case of executing the large movement of the face door **50** by using the first drive force transmission mechanism **10** will be referred to as a normal drive mode. Furthermore, the case of executing the fine movement of the face door **50** by using the second drive force transmission mechanism **15** will be referred to as a high precision drive mode.

[0110] As shown in FIGS. **2** and **3**, the normal drive mode and the high precision drive mode can be independently used by switching the transmission path of the drive force to one of the first drive force transmission mechanism **10** and the second drive force transmission mechanism **15** through use of the corresponding link pin and the corresponding link groove. Thereby, the appropriate moving mode of the face door **50** can be implemented by appropriately using the normal drive mode or the high precision drive mode according to the operation mode of the face door **50** which is required at the corresponding one of the various blowout modes.

[0111] Next, a state of each of the mechanism components **16** in the link mechanism **1** of the first embodiment will be explained for each of the blowout modes with reference to the drawings. First of all, an initial state of the link mechanism **1** will be described. The initial state of the link mechanism **1** refers to a state where the link pin **32** of the first face gear **30** is inserted in the second link groove **26** of the second link plate **25**, and the link pin **42** of the third face gear **40** is not inserted in any of the first link groove **21** and the third link groove **27**.

[0112] First of all, a state of the link mechanism **1** at the time of executing the face mode will be described with reference to FIGS. **4** to **6**. In the initial state, when the drive force generated by the drive motor **5** is inputted from the first plate support shaft **20***a*, the first link plate **20** is rotated in a predetermined direction, and then, the drive force inputted to the first link plate **20** is transmitted to the second link plate **25** through the gear portion of the first link plate **20** and the gear portion of the second link plate **25**.

[0113] The second link plate **25** is rotated about the second plate support shaft **25***a* by the transmitted drive force. At this time, since the link pin **32** of the first face gear **30** is inserted in the second link groove **26**, the drive force of the second link plate **25** is transmitted to the first face gear **30** through the contact between the second link groove **26** and the link pin **32**. Specifically, in the case of the face mode, the first drive force transmission mechanism **10** is selected as the transmission path of the drive force.

[0114] As shown in FIG. **5**, the first face gear **30**, the second face gear **35** and the fourth face gear **45** are arranged such that each corresponding two of the gear portions of the first face gear **30**, the second face gear **35** and the fourth face gear **45** are meshed with each other. Therefore, the drive force, which is inputted to the first face gear **30**, is transmitted to the face door **50** through the second face gear **35**, the fourth face gear **45** and the door shaft **51**. Specifically, the normal drive of the face door **50** is implemented by using the first drive force transmission mechanism **10**.

[0115] At this time, the gear portion of the fourth face gear **45** is meshed with the gear portion of the third face gear **40**. Thus, a portion of the drive force, which is transmitted to the fourth face gear **45**, is transmitted to the third face gear **40** to rotate the third face gear **40** about the gear shaft **40***a*.

[0116] Furthermore, as shown in FIG. **6**, the link pin **42** of the third face gear **40** is not inserted in the inside of the first link groove **21** of the first link plate **20**. Therefore, the rotation of the third face gear **40** is not interfered by the first link plate **20** and is made by the drive force transmitted from the fourth face gear **45**, and thereby the position of the link pin **42** is adjusted.

[0117] As described above, according to the link mechanism **1** of the first embodiment, during the face mode where the door opening degree of the face door **50** is large, the drive force of the drive motor **5** can be transmitted to the face door **50** in the normal drive mode by using the first drive force transmission mechanism **10**. Thus, the slide movement of the face door **50** can be controlled with the amount of movement which corresponds to the large door opening degree.

[0118] Furthermore, since the bilevel mode is a blowout mode where the door opening degree of the face door **50** is large, the normal drive mode using the first drive force transmission mechanism **10** is used in the bilevel mode like the face mode.

[0119] The drive force of the drive motor **5** is inputted to the first link plate **20** in the state of the face mode shown in FIGS. **4** to **6** to further rotate the first link plate **20** in the predetermined direction, and thereby, a mode shift state from the face mode to the hoot mode is achieved.

[0120] Since the second link plate **25** is rotated by the drive force transmitted to the second link plate **25** at the mode shift time, the link pin **32** of the first face gear **30** is moved toward the outside of the second link groove **26** and is placed in a state where the link pin **32** is out of contact with the second link groove **26**. At the same time, the first link plate **20** is also rotated by the drive force. Therefore, the link pin **42** of the third face gear **40** is moved toward the inside of the first link groove **21** of the first link plate **20**. However, the link pin **42** is not yet in contact with the first link groove **21**.

[0121] Thus, at the mode shift time, the drive force is used to move the first link plate **20** and the second link plate **25** and is not transmitted to the face door **50** serving as the driven member. At this time, the face door **50** does not move even in the state where the drive force is not transmitted to the face door **50** because the face door **50** is subject to: a slide resistance, which is generated between the face door **50** and the guide grooves of the air conditioning case **110**; the pressure of the air flow applied to the face door **50**; and the own weight of face door **50**.

[0122] When the first link plate **20** and the second link plate **25** are further rotated in the predetermined direction, the link pin **32** is placed at the outside of the second link groove **26**, and at the same time, the link pin **42** is placed at the inside of the first link groove **21**. At this time, the link pin **42** contacts the first link groove **21** at the inside of the first link groove **21**. Thereby, the drive force transmitted to the first link plate **20** is transmitted to the third face gear **40** through the first link groove **21** and the link pin **42**.

[0123] Next, a state of the link mechanism **1** at the time of executing the foot mode will be described with reference to FIGS. **7** and **8**. At the time of the foot mode, the operation shifts to the high precision drive mode that uses the second drive force transmission mechanism **15**. Therefore, as shown in FIG. **8**, the link pin **32** is placed at the outside of the second link groove **26**, and at the same time, the link pin **42** is placed at the inside of the first link groove **21**.

[0124] In this case, the first link plate **20** is further rotated in the predetermined direction by the drive force inputted to the first link plate **20**, and then the drive force is transmitted from the first link plate **20** to the second link plate **25** through the gear portion of the first link plate **20** and the gear portion of the second link plate **25**. At this time, since the link pin **42** of the third face gear **40** contacts the first link groove **21**

at the inside of the first link groove **21**, the drive force is transmitted from the first link plate **20** to the third face gear **40**.

[0125] Since the gear portion of the third face gear **40** and the gear portion of the fourth face gear **45** are meshed with each other, a portion of the drive force of the first link plate **20** is transmitted to the face door **50** through the third face gear **40**, the fourth face gear **45** and the door shaft **51**. Specifically, the high precision drive of the face door **50** is implemented by using the second drive force transmission mechanism **15**.

[0126] At this time, the gear portion of the fourth face gear **45** is meshed with the gear portion of the second face gear **35**. Thus, a portion of the drive force, which is transmitted to the fourth face gear **45**, is transmitted to the second face gear **35** and the first face gear **30** to rotate the second face gear **35** and the first face gear **30**.

[0127] Furthermore, as shown in FIG. **8**, the link pin **32** of the first face gear **30** is not inserted into the second link groove **26** and the third link groove **27** of the second link plate **25** and does not contact any one of the second link groove **26** and the third link groove **27**. Therefore, the rotation of the first face gear **30** and the rotation of the second face gear **35** are not interfered by the second link plate **25** and are made by the drive force transmitted from the fourth face gear **45**, and thereby the position of the link pin **32** is adjusted.

[0128] As described above, according to the link mechanism **1** of the first embodiment, during the foot mode where the door opening degree of the face door **50** is small, and the fine opening degree Control is required, the drive force of the drive motor **5** can be transmitted to the face door **50** in the high precision drive mode by using the second drive force transmission mechanism **15**. As a result, the fine opening control can be achieved with respect to the opening degree of the face door **50**.

[0129] When the drive force of the drive motor **5** is inputted to the first link plate **20** in the state of the foot mode shown in FIGS. **7** and **8** to further rotate the first link plate **20** in the predetermined direction, a mode shift state from the foot mode to the defroster mode is achieved.

[0130] Since the first link plate **20** is rotated by the drive force transmitted to the first link plate **20** at the mode shift time, the link pin **42** of the third face gear **40** is moved toward the outside of the first link groove **21** and is placed in a state where the link pin **42** is out of contact with the first link groove **21**. At the same time, the second link plate **25** is also rotated by the drive force. Therefore, the link pin **32** of the first face gear **30** is moved toward the inside of the third link groove **27** of the second link plate **25**. However, the link pin **32** is not yet in contact with the third link groove **27**.

[0131] Thus, at the mode shift time, the drive force is used to move the first link plate **20** and the second link plate **25** and is not transmitted to the face door **50** serving as the driven member. At this time, the face door **50** does not move even in the state where the drive force is not transmitted to the face door **50** because the face door **50** is subject to: the slide resistance, which is generated between the face door **50** and the guide grooves of the air conditioning case **110**; the pressure of the air flow applied to the face door **50**; and the own weight of face door **50**.

[0132] When the first link plate **20** and the second link plate **25** are further rotated in the predetermined direction, the link pin **42** is placed at the outside of the first link groove **21**, and at the same time, the link pin **32** is placed at the inside of the third link groove **27**. At this time, the link pin **32** contacts the third link groove **27** at the inside of the third link groove **27**. Thereby, the drive force transmitted to the second link plate **25** is transmitted to the first face gear **30** through the third link groove **27** and the link pin **32**.

[0133] Next, a state of the link mechanism **1** at the time of executing the defroster mode will be described with reference to FIGS. **9** and **10**. At the time of the defroster mode, the operation shifts to the normal drive mode that uses the first drive force transmission mechanism **10**. Therefore, as shown in FIG. **10**, the link pin **42** is placed at the outside of the first link groove **21**, and at the same time, the link pin **32** is placed at the inside of the third link groove **27**.

[0134] In this case, the first link plate **20** is further rotated in the predetermined direction by the drive force inputted to the first link plate **20**, and then the drive force is transmitted from the first link plate **20** to the second link plate **25** through the gear portion of the first link plate **20** and the gear portion of the second link plate **25**. At this time, the link pin **42** of the third face gear **40** is placed at the outside of the first link groove **21** of the first link plate **20** and does not contact the first link groove **21**. Therefore, the drive force, which is inputted to the first link plate **20**, is not transmitted to the third face gear **40**.

[0135] The second link plate **25** is rotated about the second plate support shaft **25***a* by the drive force transmitted from the first link plate **20**. At this time, since the link pin **32** of the first face gear **30** is inserted in the third link groove **27**, the drive force of the second link plate **25** is transmitted to the first face gear **30** through the contact between the third link groove **27** and the link pin **42**. Specifically, in the case of the defroster mode, the first drive force transmission mechanism **10** is selected as the transmission path of the drive force.

[0136] As shown in FIG. **9**, the first face gear **30**, the second face gear **35** and the fourth face gear **45** are arranged such that each corresponding two of the gear portions of the first face gear **30**, the second face gear **35** and the fourth face gear **45** are meshed with each other. Therefore, the drive force, which is inputted to the first face gear **30**, is transmitted to the face door **50** through the second face gear **35**, the fourth face gear **45** and the door shaft **51**. Specifically, the normal drive of the face door **50** is implemented by using the first drive force transmission mechanism **10**.

[0137] At this time, the gear portion of the fourth face gear **45** is meshed with the gear portion of the third face gear **40**. Thus, a portion of the drive force, which is transmitted to the fourth face gear **45**, is transmitted to the third face gear **40** to rotate the third face gear **40** about the gear shaft **40***a*.

[0138] As described above, the link pin **42** of the third face gear **40** is not inserted in the first link groove **21** of the first link plate **20**. Therefore, the rotation of the third face gear **40** is not interfered by the first link plate **20** and is made by the drive force transmitted from the fourth face gear **45**, and thereby the position of the link pin **42** is adjusted.

[0139] As described above, according to the link mechanism **1** of the first embodiment, during the defroster mode where the amount of movement of the face door **50** is large, and the high door stop precision is not required, the drive force of the drive motor **5** can be transmitted to the face door **50** in the normal drive mode by using the first drive force transmission mechanism **10**. As a result, the slide movement of the face door **50**, which is performed with the appropriate

door stop precision and corresponds to the large amount of movement, can be controlled.

[0140] Furthermore, since the foot/defroster mode is a blowout mode where the amount of movement of the face door **50** is large and does not require the high door stop precision, the normal drive mode using the first drive force transmission mechanism **10** is used in the foot/defroster mode like the defroster mode.

[0141] In the link mechanism **1**, the first link groove **21** of the first link plate **20**, the second link groove **26** and the third link groove **27** of the second link plate **25**, the link pin **32** of the first face gear **30** and the link pin **42** of the third face gear **40** form the transmission path switch device **90**.

[0142] Next, a relationship between: the link mechanism **1**; and the blowout mode and the drive mode, according to the first embodiment will be described with reference to FIG. **11**.

[0143] As shown in FIGS. **4** to **6**, in the case of the face mode or the bilevel mode, the link mechanism **1** is switched to the normal drive mode using the first drive force transmission mechanism **10**. At this time, the first link groove **21** of the first link plate **20** is out of contact with the link pin **42** of the third face gear **40**, and the second link groove **26** of the second link plate **25** is in contact with the link pin **32** of the first face gear **30**.

[0144] Therefore, the drive force generated by the drive motor **5** is transmitted to the face door **50** through the first link plate **20**, the second link plate **25**, the first face gear **30**, the second face gear **35**, the fourth face gear **45** and the door shaft **51**. Specifically, in the case of using the first drive force transmission mechanism **10**, the number of the mechanism components **16** is increased in comparison to that of the second drive force transmission mechanism **15**. Furthermore, the first drive force transmission mechanism **10** is configured such that the gear ratio is high, and the speed reduction ratio is high, and thereby the large slide movement of the face door **50** is possible. Thus, the appropriate movement control of the face door **50**, which corresponds to the face mode or the bilevel mode, can be achieved.

[0145] As shown in FIGS. **7** and **8**, in the case of the foot mode, the link mechanism **1** is switched to the high precision drive mode using the second drive force transmission mechanism **15**. At this time, each of the second link groove **26** and the third link groove **27** of the second link plate **25** is out of contact with the link pin **32** of the first face gear **30**, and the first link groove **21** of the first link plate **20** is in contact with the link pin **42** of the third face gear **40**.

[0146] Therefore, the drive force generated by the drive motor **5** is transmitted to the face door **50** through the first link plate **20**, the third face gear **40**, the fourth face gear **45** and the door shaft **51**. Specifically, in the case of using the second drive force transmission mechanism **15**, the number of the mechanism components **16** is reduced in comparison to that of the first drive force transmission mechanism **10**, and the influence of the tolerances of the respective mechanism components **16** is reduced. Furthermore, the second drive force transmission mechanism **15** is configured such that the gear ratio is low, and the speed reduction ratio is low, and thereby fine slide movement of the face door **50** is possible. Thus, the appropriate movement control of the face door **50**, which corresponds to the foot mode, can be achieved.

[0147] As shown in FIGS. **9** and **10**, in the case of the defroster mode or the foot/defroster mode, the link mechanism **1** is switched to the normal drive mode using the first drive force transmission mechanism **10**. At this time, the first link groove **21** of the first link plate **20** is out of contact with the link pin **42** of the third face gear **40**, and the third link groove **27** of the second link plate **25** is in contact with the link pin **32** of the first face gear **30**.

[0148] Therefore, the drive force generated by the drive motor **5** is transmitted to the face door **50** through the first link plate **20**, the second link plate **25**, the first face gear **30**, the second face gear **35**, the fourth face gear **45** and the door shaft **51**. Specifically, in the case of using the first drive force transmission mechanism **10**, the number of the mechanism components **16** is increased. Furthermore, the first drive force transmission mechanism **10** is configured such that the gear ratio is high, and the speed reduction ratio is high, and thereby the large slide movement of the face door **50** is possible. Thus, the appropriate movement control of the face door **50**, which corresponds to the defroster mode or the foot/defroster mode, can be achieved.

[0149] Furthermore, as shown in FIG. **11**, during the mode shift time, the link pin **32** and the link pin **42** are both out of contact with: the first link groove **21** of the first link plate **20**; and the second link groove **26** and the third link groove **27** of the second link plate **25**. In order to complete the mode shift, the link pin **32** or the link pin **42** needs to contact one of the link grooves at the inside of the one of the link grooves.

[0150] Details of the operation of the respective mechanism components **16** during the mode shift time of the link mechanism **1** of the first embodiment will be described with reference to FIGS. **12** to **15**. FIGS. **12** to **15** indicate states of the respective mechanism components **16** in the case of shifting the link mechanism **1** of the first embodiment from the face mode to the foot mode.

[0151] FIG. **12** shows a state of the link mechanism **1** during the face mode as a first state at the mode shift time for shifting from the face mode to the foot mode. FIG. **13** shows anther state, which is after rotating the first link plate **20** in the predetermined direction from the state shown in FIG. **12**, as a second state at the mode shift time for shifting from the face mode to the foot mode. FIG. **14** shows a further state, which is after further rotating the first link plate **20** in the predetermined direction from the state shown in FIG. **13**, as a third state at the mode shift time for shifting from the face mode to the foot mode. FIG. **15** shows a further state, which is shifted to the foot mode by rotating the first link plate **20** in the predetermined direction from the state shown in FIG. **14**, as a fourth state at the mode shift time for shifting from the face mode to the foot mode.

[0152] As shown in FIG. **12**, in the case of the face mode, the link pin **32** of the first face gear **30** contacts the second link groove **26** of the second link plate **25** at the inside of the second link groove **26**. Furthermore, the link pin **42** of the third face gear **40** is placed at the outside of the first link groove **21** of the first link plate **20**.

[0153] Therefore, the drive force, which is transmitted from the first link plate **20** to the second link plate **25**, is transmitted to the first face gear **30** through the contact of the link pin **32** with the second link groove **26**. Furthermore, the drive force, which is transmitted to the first face gear **30**, is transmitted to the face door **50** through the second face gear **35**, the fourth face gear **45** and the door shaft **51**.

[0154] As shown in FIGS. **12** to **14**, the second link plate **25** is rotated by the drive force, and the first face gear **30** is

rotated about the gear shaft **30***a*. In response to the rotation of the second link plate **25** and the rotation of the first face gear **30**, the link pin **32** is moved out of the second link groove **26**.

[0155] Here, the gear portion of the third face gear **40** is meshed with the gear portion of the fourth face gear **45**, and the link pin **42** is placed at the outside of the first link groove **21**. The third face gear **40** is rotated about the gear shaft **40***a* by a portion of the drive force which is transmitted to the fourth face gear **45**. Therefore, the link pin **42** of the third face gear **40** is moved into the first link groove **21** from the open end portion of the first link groove **21**.

[0156] Specifically, according to the link mechanism **1**, the movement of the link pin **32** and the movement of the link pin **42** can be synchronized by distributing a portion of the drive force for driving the face door **50** through the fourth face gear **45**. In the case shown in FIGS. **12** to **15**, the link pin **42** can be moved toward the inside of the first link groove **21** in response to moving out of the link pin **32** from the second link groove **26** by transmitting the drive force from the fourth face gear **45** to the third face gear **40**.

[0157] Furthermore, as shown in FIGS. **12** to **15**, each of the two opposite end portions of first link groove **21** of the first link plate **20** is opened to enable insertion of the link pin **42** therethrough and has an enlarged width portion **21***w*. A width of each of the enlarged width portions **21***w* is larger than a width of an intermediate portion of the first link groove **21** which is located between the two opposite end portions of the first link groove **21**.

[0158] Furthermore, at the second link plate **25**, one of two opposite end portions of the second link groove **26** and one of two opposite end portions of the third link groove **27** are opened to enable insertion of the link pin **32** therethrough and have an enlarged width portion **26***w* and an enlarged width portion **27***w*, respectively. A width of the enlarged width portion **26***w* is larger than a width of an intermediate portion of the second link groove **26** which is located between the two opposite end portions of the second link groove **26**. A width of the enlarged width portion **27***w* is larger than a width of an intermediate portion of the third link groove **27** which is located between the two opposite end portions of the third link groove **27**.

[0159] Since the enlarged width portion **26***w* is formed at the one end portion of the second link groove **26**, it is possible to limit catching (holding) of the link pin **32** at the one end portion of the second link groove **26** at the time of inserting the link pin **32** into the inside of the second link groove **26**. Also, since the enlarged width portion **27***w* is formed at the one end portion of the third link groove **27**, it is possible to limit catching of the link pin **32** at the one end portion of the third link groove **27** at the time of inserting the link pin **32** into the inside of the third link groove **27**. Furthermore, since the enlarged width portion **21***w* is formed at each of the two opposite end portions of the first link groove **21**, it is possible to limit catching of the link pin **42** at each of the two opposite end portions of the first link groove **21** at the time of inserting the link pin **42** into the inside of the first link groove **21**.

[0160] In other words, by forming the enlarged width portion at the open end portion of each link groove, the link mechanism **1** enables the smooth mode shift operation for shifting between the normal drive mode and the high precision drive mode, and thereby enables the reliable mode shift.

[0161] In the example shown in FIGS. **12** to **15**, although there is described the operation at the mode shift time for shifting from the face mode to the foot mode, the present disclosure is not limited to this. Specifically, the effects and the actions, which are similar to the above-described ones, can be also achieved at the mode shift time for shifting from the foot mode to the defroster mode, the mode shift time for shifting from the foot mode to the face mode and the mode shift time for shifting from the defroster mode to the foot mode.

[0162] As described above, the link mechanism **1** of the first embodiment is applied to the vehicle air conditioning apparatus **100** and is used at the time of transmitting the drive force of the drive motor **5** to the face door **50** for sliding the face door **50**.

[0163] According to the link mechanism **1** of the first embodiment, the transmission path switch device **90** switches the transmission path, which transmits the drive force from the drive motor **5** to the face door **50**, to one of the transmission path through the first drive force transmission mechanism **10** and the transmission path through the second drive force transmission mechanism **15**. The first drive force transmission mechanism **10** and the second drive force transmission mechanism **15** are configured to transmit the drive force to the face door **50** at the different speed reduction ratios, respectively. Therefore, the link mechanism **1** can realize the two different modes as the moving modes (e.g., the modes for implementing the two different amounts of movement) of the face door **50** realized by the action of the drive force. As a result, the link mechanism **1** can move the face door **50** by the appropriate amount of movement according to the scene by using the two different moving modes.

[0164] Furthermore, as shown in FIGS. **2** to **11**, the number of the mechanism components **16**, which form the second drive force transmission mechanism **15**, is different from and is smaller than the number of the mechanism components **16**, which form the first drive force transmission mechanism **10**. Thereby, the amount of influence of the tolerances of the respective mechanism components **16** on the transmission of the drive force can be different between the first drive force transmission mechanism **10** and the second drive force transmission mechanism **15**. Specifically, the precision with respect to the control of the movement of the face door **50** differs between the case of using the first drive force transmission mechanism **10** and the case of using the second drive force transmission mechanism **15**.

[0165] As shown in FIGS. **2** to **10**, the first drive force transmission mechanism **10**, which has the high speed reduction ratio, includes at least two gears, such as the first face gear **30** and the second face gear **35**, as the mechanism components **16**. Therefore, in the case of implementing the high precision drive with the second drive force transmission mechanism **15**, it is essential to use the gear such as the third face gear **40**. In other words, by using the structure having the small number of the mechanism components, the high precision drive can be achieved with the first drive force transmission mechanism **10** and the second drive force transmission mechanism **15**.

[0166] As shown in FIGS. **4** to **6**, **9** and **10**, in the face mode or the defroster mode where the amount of movement of the face door **50** is large, the link mechanism **1** operates the transmission path switch device **90** to achieve the slide movement of the face door **50** through use of the first drive

force transmission mechanism **10** having the high speed reduction ratio. Furthermore, as shown in FIGS. **7** and **8**, in the foot mode where the amount of movement of the face door **50** is small, the link mechanism **1** operates the transmission path switch device **90** to achieve the slide movement of the face door **50** through use of the second drive force transmission mechanism **15** having the low speed reduction ratio. Thus, the link mechanism **1** operates the transmission path switch device **90** to switch between the first drive force transmission mechanism **10** and the second drive force transmission mechanism **15** in the selected mode required by, for example, a corresponding one of the blowout modes.

[0167] In the link mechanism **1** of the first embodiment, the first drive force transmission mechanism **10** having the high speed reduction ratio includes the plurality of gears, which includes: the second link plate **25**; the first face gear **30** having the lever **31** and the link pin **32**; and the second face gear **35**, as the mechanism components **16**. Therefore, the drive force, which is transmitted to the second link plate **25**, can be reliably transmitted to the face door **50**.

[0168] The second drive force transmission mechanism **15** having the low speed reduction ratio includes: the first link plate **20**; and the third face gear **40** having the lever **41** and the link pin **42**, as the mechanism components **16**. Thus, the drive force, which is transmitted to the first link plate **20**, can be reliably transmitted to the face door **50**, and the fine movement control of the face door **50** can be realized.

[0169] In the case of transmitting the drive force by using the first drive force transmission mechanism **10**, the link pin **32** comes in contact with the second link groove **26** or the third link groove **27** of the second link plate **25** without contacting the link pin **42** to the first link groove **21** of the first link plate **20**. In contrast, in the case of transmitting the drive force by using the second drive force transmission mechanism **15**, the link pin **42** comes in contact with the first link groove **21** of the first link plate **20** without contacting the link pin **32** to the second link groove **26** and the third link groove **27** of the second link plate **25**. Therefore, the transmission path switch device **90** of the link mechanism **1** can selectively use the first drive force transmission mechanism **10** or the second drive force transmission mechanism **15** as the transmission path of the drive force.

[0170] As shown in FIGS. **12** to **15**, in the case of transmitting the drive force through the first drive force transmission mechanism **10**, a portion of the drive force to be transmitted to the face door **50** can be distributed to the third face gear **40** through the fourth face gear **45**. Thereby, the link pin **42** can be moved toward the first link groove **21** of the first link plate **20** as the link pin **32** moves out of the second link groove **26** or the third link groove **27** of the second link plate **25**. Specifically, the transmission path switch device **90** can reliably achieve the mode shift at the link mechanism **1**.

[0171] Furthermore, in the case of transmitting the drive force through the second drive force transmission mechanism **15**, a portion of the drive force to be transmitted to the face door **50** can be distributed to the second face gear **35** and the first face gear **30** through the fourth face gear **45**. Thereby, the link pin **32** can be moved toward one of the second link groove **26** and the third link groove **27** of the second link plate **25** as the link pin **42** moves out of the first link groove **21** of the first link plate **20**. Specifically, even in this case, the transmission path switch device **90** can reliably achieve the mode shift at the link mechanism **1**.

[0172] As shown in FIGS. **4** to **15**, the two enlarged width portions **21***w* are formed at the two opposite end portions, respectively, of the first link groove **21**. The enlarged width portion **26***w* is formed at the one end portion of the second link groove **26**, and the enlarged width portion **27***w* is formed at the one end portion of the third link groove **27**. Thus, it is possible to limit catching of the link pin at the end portion of the link groove at the time of inserting the link pin into the inside of the link groove, and thereby, it is possible to reliably achieve the mode shift.

[0173] Furthermore, the link mechanism **1** of the first embodiment is applied to the vehicle air conditioning apparatus **100** and is used to transmit the drive force to the face door **50** that is formed as the slide door for adjusting the opening cross-sectional area of the face opening **150**. The appropriate opening degree of the face door **50** varies depending on the selected blowout mode at the vehicle air conditioning apparatus **100**. That is, by controlling the amount of slide movement of the face door **50** through use of the link mechanism **1**, it is possible to achieve the appropriate opening degree Control of the face opening **150** which corresponds to the selected blowout mode.

Second Embodiment

[0174] Next, a second embodiment will be described with reference to FIG. **16** in view of differences which are different from the embodiment described above. The second embodiment differs from the embodiment described above with respect to the way of transmitting the drive force of the drive motor **5** to the first link plate **20** and the second link plate **25**. Since the rest of the basic structure is the same as that of the embodiment described above, description of the rest of the basic structure is omitted.

[0175] As shown in FIG. **16**, in the link mechanism **1** of the second embodiment, the drive force generated by the drive motor **5** is inputted to a transmission link plate **81**. The first link plate **20** of the second embodiment is installed such that the gear portion of the first link plate **20** is meshed with a gear portion of the transmission link plate **81**. Furthermore, the second link plate **25** of the second embodiment is installed such that the gear portion of the second link plate **25** is meshed with the gear portion of the transmission link plate **81** at a location that is different from the location where the gear portion of the first link plate **20** is meshed with the gear portion of the transmission link plate **81**.

[0176] Thus, the drive force of the drive motor **5** is transmitted to each of the first link plate **20** and the second link plate **25** through the transmission link plate **81**. The transmission path of the drive force, which is transmitted to the first link plate **20** and the second link plate **25**, and the operation of the transmission path switch device **90** are the same as those in the first embodiment.

[0177] As described above, according to the link mechanism **1** of the second embodiment, the same advantages as in the embodiment described above can be achieved even in the case where the transmission link plate **81** is placed between: the drive motor **5**; and the first link plate **20** and the second link plate **25**.

Third Embodiment

[0178] Next, a third embodiment will be described with reference to FIG. **17** in view of differences which are

different from the embodiments described above. The third embodiment differs from the first and second embodiments with respect to the way of transmitting the drive force of the drive motor **5** to the first link plate **20** and the second link plate **25**. Since the rest of the basic structure is the same as that of the embodiments described above, description of the rest of the basic structure is omitted.

[0179] As shown in FIG. **17**, in the link mechanism **1** of the third embodiment, the drive force of the drive motor **5** is inputted to the transmission link plate **81**. The first link plate **20** of the third embodiment is installed such that the gear portion of the first link plate **20** is meshed with the gear portion of the transmission link plate **81**.

[0180] Here, the second link plate **25** of the third embodiment is installed such that the gear portion of the second link plate **25** is meshed with the gear portion of the first link plate **20** like in the first embodiment. Therefore, the link mechanism **1** of the third embodiment operates in the same manner as the first embodiment, except that the drive force of the drive motor **5** is inputted to the first link plate **20** through the transmission link plate **81**. For this reason, the description of the points, which are similar to those in the first embodiment, are omitted.

[0181] As described above, according to the link mechanism **1** of the third embodiment, the same advantages as in the embodiments described above can be achieved even in the case where the drive force of the drive motor **5** is transmitted to the first link plate **20** through the transmission link plate **81**.

Fourth Embodiment

[0182] Next, a fourth embodiment will be described with reference to FIG. **18** in view of differences which are different from the embodiments described above. The fourth embodiment differs from the embodiments described above with respect to the way of transmitting the drive force from the first link plate **20** to the second link plate **25**. Since the rest of the basic structure is the same as that of the embodiments described above, description of the rest of the basic structure is omitted.

[0183] As shown in FIG. **18**, in the link mechanism **1** of the fourth embodiment, the drive force of the drive motor **5** is inputted to the first link plate **20** like in the first embodiment. Here, a coupling link plate **82** is placed between the first link plate **20** and the second link plate **25**. A gear portion of the coupling link plate **82** is meshed with the gear portion of the first link plate **20** and the gear portion of the second link plate **25**.

[0184] Thus, the drive force, which is transmitted to the first link plate **20**, is transmitted to the second link plate **25** through the coupling link plate **82**. Therefore, the link mechanism **1** of the fourth embodiment operates in the same manner as the embodiments described above, except that the drive force is transmitted between the first link plate **20** and the second link plate **25** through the coupling link plate **82**. For this reason, the description of the points, which are similar to those in the embodiments described above, are omitted.

[0185] As described above, according to the link mechanism **1** of the fourth embodiment, the same advantages as in the embodiments described above can be achieved even in the structure where the drive force is transmitted between the first link plate **20** and the second link plate **25** through the coupling link plate **82**.

Fifth Embodiment

[0186] Next, a fifth embodiment will be described with reference to FIGS. **19** to **25** in view of differences which are different from the embodiments described above. The fifth embodiment differs from the embodiments described above with respect to use of a common link plate **83**, which is common to the first drive force transmission mechanism **10** and the second drive force transmission mechanism **15**, in place of the first link plate **20** and the second link plate **25**. Since the rest of the basic structure is the same as that of the embodiments described above, description of the rest of the basic structure is omitted.

[0187] As shown in FIGS. **19** to **26**, the link mechanism **1** of the fifth embodiment includes the first face gear **30**, the second face gear **35**, the third face gear **40**, the fourth face gear **45**, the door shaft **51** and the face door **50** like in the embodiments described above. These mechanism components **16** are the same as those described in the embodiments described above.

[0188] In the link mechanism **1** of the fifth embodiment, the common link plate **83** is placed between: the drive motor **5**; and the first face gear **30** and the third face gear **40**. As shown in FIG. **19**, the common link plate **83** is a link plate to which the drive force of the drive motor **5** is inputted in both of the case of using the first drive force transmission mechanism **10** and the case of using the second drive force transmission mechanism **15**. The common link plate **83** transmits the drive force inputted from the drive motor **5** to the first face gear **30** of the first drive force transmission mechanism **10** or the third face gear **40** of the second drive force transmission mechanism **15**.

[0189] As shown in FIG. **20**, the common link plate **83** is arranged to oppose the mechanism components **16** (the first to fourth face gears **30**, **35**, **40**, **45**) which are installed to the outer surface of the air conditioning case **110**. The common link plate **83** is installed to a plate support shaft **83***a* placed at the outside of the air conditioning case **110** and is rotated by the drive force generated by the drive motor **5**.

[0190] As shown in FIGS. **20** to **22**, the common link plate **83** has a first link groove **84**, a second link groove **85** and a third link groove **86** formed at a surface of the common link plate **83** which is opposed to the outer surface of the air conditioning case **110**.

[0191] The first link groove **84** is in a form of a groove that extends along a semicircle centered on the plate support shaft **83***a*, and two opposite end portions of the first link groove **84** are both opened. The first link groove **84** is formed such that the link pin **42** of the third face gear **40** can be inserted into the first link groove **84**. The drive force, which is transmitted to the common link plate **83**, can be transmitted to the third face gear **40** through contact of the link pin **42** to the first link groove **84** at the inside of the first link groove **84**.

[0192] The second link groove **85** is in a form of a groove that extends along a semicircle centered on the plate support shaft **83***a*, and one of two opposite end portions of the second link groove **85** is opened, and the other one of the two opposite end portions of the second link groove **85** is closed. Like the second link groove **85**, the third link groove **86** is in a form of a groove that extends along a semicircle centered on the plate support shaft **83***a*, and one of two opposite end portions of the third link groove **86** is opened, and the other one of the opposite end portions of the third link groove **86** is closed.

[0193] The second link groove **85** and the third link groove **86** are placed closer to the plate support shaft **83***a* than the first link groove **84**. A distance between the second link groove **85** and the plate support shaft **83***a* is substantially the same as a distance between the third link groove **86** and the plate support shaft **83***a*.

[0194] Furthermore, each of the second link groove **85** and the third link groove **86** is formed such that the link pin **32** of the first face gear **30** can be inserted into each of the second link groove **85** and the third link groove **86** through the open end portion thereof. The drive force, which is transmitted to the common link plate **83**, can be transmitted to the first face gear **30** through contact of the link pin **32** to the second link groove **85** at the inside of the second link groove **85**. Also, the drive force, which is transmitted to the common link plate **83**, can be transmitted to the first face gear **30** through contact of the link pin **32** to the third link groove **86** at the inside of the third link groove **86**. As shown in FIG. **22**, the open end portion of the second link groove **85** and the open end portion of the third link groove **86** are spaced from each other by a distance and are opposed to each other. Therefore, the link pin **32**, which is moved from the inside to the outside of one of the second link groove **85** and the third link groove **86**, is moved a predetermined distance and is then moved into the inside of the other one of the second link groove **85** and the third link groove **86**.

[0195] Therefore, even in the link mechanism **1** of the fifth embodiment, the drive force transmitted from the drive motor **5** through the common link plate **83** can be transmitted to the face door **50** through one of the first drive force transmission mechanism **10** and the second drive force transmission mechanism **15**.

[0196] Furthermore, each of the two opposite end portions of the first link groove **84** is opened to enable insertion of the link pin **42** therethrough and has an enlarged width portion **84***w*. A width of the enlarged width portion **84***w* is larger than a width of an intermediate portion of the first link groove **84** which is located between the two opposite end portions of the first link groove **84**. Furthermore, one of two opposite end portions of the second link groove **85** and one of two opposite end portions of the third link groove **86** are opened to enable insertion of the link pin **42** therethrough and have an enlarged width portion **85***w* and an enlarged width portion **86***w*, respectively. A width of the enlarged width portion **85***w* is larger than a width of an intermediate portion of the second link groove **85** which is located between the two opposite end portions of the second link groove **85**. A width of the enlarged width portion **86***w* is larger than a width of an intermediate portion of the third link groove **86** which is located between the two opposite end portions of the third link groove **86**. Therefore, even in the link mechanism **1** of the fifth embodiment, the operation at the mode shift time can be smoothly performed with the enlarged width portions **84***w*, **85***w*, **86***w*.

[0197] Next, the state of each of the mechanism components **16** in the link mechanism **1** of the fifth embodiment will be explained for each of the blowout modes with reference to the drawings.

[0198] First of all, a state of the link mechanism **1** at the time of executing the face mode will be described with reference to FIGS. **20** to **22**. In the initial state, which is similar to that of the first embodiment, when the drive force generated by the drive motor **5** is inputted through the plate support shaft **83***a*, the common link plate **83** is rotated in a predetermined direction.

[0199] At this time, since the link pin **32** of the first face gear **30** is inserted in the second link groove **85**, the drive force of the common link plate **83** is transmitted to the first face gear **30** through the contact between the second link groove **85** and the link pin **32**. Specifically, in the case of the face mode, the first drive force transmission mechanism **10** is selected as the transmission path of the drive force.

[0200] As shown in FIG. **21**, the first face gear **30**, the second face gear **35** and the fourth face gear **45** are arranged such that each corresponding two of the gear portions of the first face gear **30**, the second face gear **35** and the fourth face gear **45** are meshed with each other. Therefore, the drive force, which is inputted to the first face gear **30**, is transmitted to the face door **50** through the second face gear **35**, the fourth face gear **45** and the door shaft **51**. Specifically, even in the link mechanism **1** of the fifth embodiment, the normal drive of the face door **50** is implemented by using the first drive force transmission mechanism **10**.

[0201] At this time, the gear portion of the fourth face gear **45** is meshed with the gear portion of the third face gear **40**. Thus, a portion of the drive force, which is transmitted to the fourth face gear **45**, is transmitted to the third face gear **40** to rotate the third face gear **40** about the gear shaft **40***a*.

[0202] Furthermore, as shown in FIG. **22**, the link pin **42** of the third face gear **40** is not inserted in the inside of the first link groove **84**. Therefore, the rotation of the third face gear **40** is not interfered by the contact between the first link groove **84** and the link pin **42** and is made by the drive force transmitted from the fourth face gear **45**, and thereby the position of the link pin **42** is adjusted.

[0203] As described above, according to the link mechanism **1** of the fifth embodiment, during the face mode where the door opening degree of the face door **50** is large, the drive force of the drive motor **5** can be transmitted to the face door **50** in the normal drive mode by using the first drive force transmission mechanism **10**. Thus, the slide movement of the face door **50** can be controlled with the amount of movement which corresponds to the large door opening degree.

[0204] Next, a state of the link mechanism **1** at the time of executing the foot mode will be described with reference to FIGS. **23** and **24**. At the time of the foot mode, the operation shifts to the high precision drive mode that uses the second drive force transmission mechanism **15**. Therefore, as shown in FIG. **24**, the link pin **32** is placed at the outside of the second link groove **85** and the third link groove **86**, and at the same time, the link pin **42** is placed at the inside of the first link groove **84**.

[0205] In this case, the common link plate **83** is further rotated in the predetermined direction by the drive force inputted to the common link plate **83**. At this time, since the link pin **42** of the third face gear **40** contacts the first link groove **84** at the inside of the first link groove **84**, the drive force is transmitted from the common link plate **83** to the third face gear **40**.

[0206] Since the gear portion of the third face gear **40** and the gear portion of the fourth face gear **45** are meshed with each other, a portion of the drive force of the common link plate **83** is transmitted to the face door **50** through the third face gear **40**, the fourth face gear **45** and the door shaft **51**.

Specifically, the high precision drive of the face door **50** is implemented by using the second drive force transmission mechanism **15**.

[0207] At this time, the gear portion of the fourth face gear **45** is meshed with the gear portion of the second face gear **35**. Thus, a portion of the drive force, which is transmitted to the fourth face gear **45**, is transmitted to the second face gear **35** and the first face gear **30**.

[0208] Furthermore, as shown in FIG. **24**, the link pin **32** of the first face gear **30** is not inserted into the second link groove **85** and the third link groove **86** and does not contact any one of the second link groove **85** and the third link groove **86**. Therefore, the rotation of the first face gear **30** and the rotation of the second face gear **35** are not interfered by the link pin **32** and the second link groove **85** and are made by the drive force transmitted from the fourth face gear **45**, and thereby the position of the link pin **32** is adjusted.

[0209] As described above, according to the link mechanism **1** of the fifth embodiment, during the foot mode where the door opening degree of the face door **50** is small, and the fine opening degree Control is required, the drive force of the drive motor **5** can be transmitted to the face door **50** in the high precision drive mode by using the second drive force transmission mechanism **15**. As a result, the fine opening control can be achieved with respect to the opening degree of the face door **50**.

[0210] Next, a state of the link mechanism **1** at the time of executing the defroster mode will be described with reference to FIGS. **25** and **26**. At the time of the defroster mode, the operation shifts to the normal drive mode that uses the first drive force transmission mechanism **10**. Therefore, as shown in FIG. **26**, the link pin **42** is placed at the outside of the first link groove **84**, and at the same time, the link pin **32** is placed at the inside of the third link groove **86**.

[0211] In this case, the common link plate **83** is further rotated in the predetermined direction by the drive force inputted to the common link plate **83**. At this time, the link pin **42** of the third face gear **40** is placed at the outside of the first link groove **84** and does not contact the first link groove **84**. Therefore, the drive force, which is inputted to the common link plate **83**, is not transmitted to the third face gear **40**.

[0212] At this time, since the link pin **32** of the first face gear **30** is inserted in the third link groove **86**, the drive force of the common link plate **83** is transmitted to the first face gear **30** through the contact between the third link groove **86** and the link pin **32**. Specifically, in the case of the defroster mode, the first drive force transmission mechanism **10** is selected as the transmission path of the drive force.

[0213] As shown in FIG. **25**, the first face gear **30**, the second face gear **35** and the fourth face gear **45** are arranged such that each corresponding two of the gear portions of the first face gear **30**, the second face gear **35** and the fourth face gear **45** are meshed with each other. Therefore, the drive force, which is inputted to the first face gear **30**, is transmitted to the face door **50** through the second face gear **35**, the fourth face gear **45** and the door shaft **51**. Specifically, the normal drive of the face door **50** is implemented by using the first drive force transmission mechanism **10**.

[0214] At this time, the gear portion of the fourth face gear **45** is meshed with the gear portion of the third face gear **40**. Thus, a portion of the drive force, which is transmitted to the fourth face gear **45**, is transmitted to the third face gear **40** to rotate the third face gear **40** about the gear shaft **40***a*.

[0215] As discussed above, the link pin **42** of the third face gear **40** is not inserted in the inside of the first link groove **84**. Therefore, the rotation of the third face gear **40** is not interfered by the contact between the first link groove **84** and the link pin **42** and is made by the drive force transmitted from the fourth face gear **45**, and thereby the position of the link pin **42** is adjusted.

[0216] As described above, according to the link mechanism **1** of the fifth embodiment, during the defroster mode where the amount of movement of the face door **50** is large, and the high door stop precision is not required, the drive force of the drive motor **5** can be transmitted to the face door **50** in the normal drive mode by using the first drive force transmission mechanism **10**. As a result, the slide movement of the face door **50**, which is performed with the appropriate door stop precision and corresponds to the large amount of movement, can be controlled.

[0217] In the link mechanism **1** of the fifth embodiment, the first link groove **84**, the second link groove **85** and the third link groove **86** of the common link plate **83**, the link pin **32** of the first face gear **30**, and the link pin **42** of the third face gear **40** form the transmission path switch device **90**.

[0218] As described above, according to the link mechanism **1** of the fifth embodiment, the same advantages as in the embodiments described above can be achieved even in the case where the common link plate **83** is used in place of the first link plate **20** and the second link plate **25** of the embodiments described above.

Sixth Embodiment

[0219] Next, a sixth embodiment will be described with reference to FIG. **27** in view of differences which are different from the embodiments described above. The sixth embodiment differs from the fifth embodiment described above with respect to the way of transmitting the drive force of the drive motor **5** to the common link plate **83**. Since the rest of the basic structure is the same as that of the fifth embodiment described above, description of the rest of the basic structure is omitted.

[0220] As shown in FIG. **27**, in the link mechanism **1** of the sixth embodiment, the drive force generated by the drive motor **5** is inputted to the transmission link plate **81**. The common link plate **83** of the sixth embodiment is installed such that the gear portion of the common link plate **83** is meshed with the gear portion of the transmission link plate **81**.

[0221] Thus, the drive force of the drive motor **5** is transmitted to the common link plate **83** through the transmission link plate **81**. The transmission path of the drive force, which is transmitted to the common link plate **83**, and the operation of the transmission path switch device **90** are the same as those of the fifth embodiment.

[0222] As described above, according to the link mechanism **1** of the sixth embodiment, the same advantages as in the embodiments described above can be achieved even in the case where the transmission link plate **81** is placed between the drive motor **5** and the common link plate **83**.

[0223] The present disclosure is not limited to the above-described embodiments and may be modified in various ways as follows without departing from the spirit of the present disclosure.

[0224] In the embodiments described above, the link mechanism **1** is applied to the vehicle air conditioning apparatus **100**. However, the present disclosure is not limited

to this application. The link mechanism of the present disclosure can be applied to any of various devices as long as it is configured to move the driven member by transmitting the drive force generated by the drive device.

[0225] Furthermore, in the embodiments described above, the face door **50**, which is configured to adjust the opening degree of the face opening **150** at the vehicle air conditioning apparatus **100**, is used as the driven member. However, the driven member of the present disclosure is not limited to this. The driven member is not limited to the slide door, such as the face door **50**, and may be any driven member as long as the driven member is moved by the drive force from the drive device (e.g., the drive motor **5**).

[0226] The types of the mechanism components **16** of the first drive force transmission mechanism **10** and the second drive force transmission mechanism **15** at the link mechanism **1** are not limited to those described in the above embodiments. Any other components, which can transmit the drive force, may be used as the mechanism components **16**.

[0227] Furthermore, the shapes and the locations of the first to third link grooves of the embodiments described above are mere examples and are thereby not limited to the above-described ones. The shapes and the locations of the first to third link grooves may be appropriately set according to the required movement of the driven member (e.g., the face door **50**).

[0228] Although the present disclosure has been described with reference to the embodiments and the modifications, it is understood that the present disclosure is not limited to the embodiments and the modifications and structures described therein. The present disclosure also includes various variations and variations within the equivalent range. Also, various combinations and forms, as well as other combinations and forms that include only one component, more, or less, are within the scope and ideology of the present disclosure.

What is claimed is:

1. A link mechanism comprising:

a drive device that is configured to generate a drive force;

a slide door that is configured to be moved by an action of the drive force generated by the drive device;

a first drive force transmission mechanism that is configured to transmit the drive force, which is generated by the drive device, to the slide door at a speed reduction ratio which is predetermined;

a second drive force transmission mechanism that is configured to transmit the drive force, which is generated by the drive device, to the slide door at a speed reduction ratio which is different from the speed reduction ratio of the first drive force transmission mechanism; and

a transmission path switch device that is configured to switch a transmission path, along which the drive force is transmitted from the drive device toward the slide door, to one of the first drive force transmission mechanism and the second drive force transmission mechanism.

2. The link mechanism according to claim **1**, wherein:

each of the first drive force transmission mechanism and the second drive force transmission mechanism includes a plurality of mechanism components which are configured to transmit the drive force toward the slide door; and

a number of the plurality of mechanism components of the first drive force transmission mechanism is different from a number of the plurality of mechanism components of the second drive force transmission mechanism.

3. The link mechanism according to claim **1**, wherein the plurality of mechanism components of one of the first drive force transmission mechanism and the second drive force transmission mechanism, which has the speed reduction ratio higher than the speed reduction ratio of another one of the first drive force transmission mechanism and the second drive force transmission mechanism, includes at least two gears.

4. The link mechanism according to claim **2**, wherein:

the transmission path switch device is configured to use one of the first drive force transmission mechanism and the second drive force transmission mechanism, the speed reduction ratio of which is higher than the speed reduction ratio of another one of the first drive force transmission mechanism and the second drive force transmission mechanism, to transmit the drive force to the slide door in a case where an amount of movement of the slide door is larger than a predetermined amount; and

the transmission path switch device is configured to use the another one of the first drive force transmission mechanism and the second drive force transmission mechanism, the speed reduction ratio of which is lower than the speed reduction ratio of the one of the first drive force transmission mechanism and the second drive force transmission mechanism, to transmit the drive force to the slide door in a case where the amount of movement of the slide door is smaller than the predetermined amount.

5. The link mechanism according to claim **2**, wherein the plurality of mechanism components of one of the first drive force transmission mechanism and the second drive force transmission mechanism, which has the speed reduction ratio higher than the speed reduction ratio of another one of the first drive force transmission mechanism and the second drive force transmission mechanism, include:

a link plate that is configured to be rotated by the drive force and has a link groove in a form of a groove, wherein at least one of two opposite end portions of the link groove is opened;

a lever that is rotatably supported and has a link pin, which is configured to be inserted in an inside of the link groove; and

a plurality of gears that are configured to be rotated and thereby transmit the drive force.

6. The link mechanism according to claim **2**, wherein the plurality of mechanism components of one of the first drive force transmission mechanism and the second drive force transmission mechanism, which has the speed reduction ratio lower than the speed reduction ratio of another one of the first drive force transmission mechanism and the second drive force transmission mechanism, include:

a link plate that is configured to be rotated by the drive force and has a link groove in a form of a groove, wherein at least one of two opposite end portions of the link groove is opened; and

a lever that is rotatably supported and has a link pin, which is configured to be inserted in an inside of the link groove.

7. The link mechanism according to claim 2, wherein:

the plurality of mechanism components of each of the first drive force transmission mechanism and the second drive force transmission mechanism, include:

a link plate that is configured to be rotated by the drive force and has a link groove in a form of a groove, wherein at least one of two opposite end portions of the link groove is opened; and

a lever that is rotatably supported and has a link pin, which is configured to be inserted in an inside of the link groove;

in a case where the drive force is transmitted to the slide door through the first drive force transmission mechanism, the transmission path switch device places the link groove of the first drive force transmission mechanism in contact with the link pin of the first drive force transmission mechanism without contacting the link groove of the second drive force transmission mechanism to the link pin of the second drive force transmission mechanism; and

in a case where the drive force is transmitted to the slide door through the second drive force transmission mechanism, the transmission path switch device places the link groove of the second drive force transmission mechanism in contact with the link pin of the second drive force transmission mechanism without contacting the link groove of the first drive force transmission mechanism to the link pin of the first drive force transmission mechanism.

8. The link mechanism according to claim 7, wherein:

in the case where the drive force is transmitted to the slide door through the first drive force transmission mechanism, the transmission path switch device distributes a portion of the drive force, which is directed to the slide door, through use of at least one of the plurality of mechanism components of the second drive force transmission mechanism, and thereby

the transmission path switch device moves the link pin of the second drive force transmission mechanism toward an inside of the link groove of the second drive force transmission mechanism as the link pin of the first drive force transmission mechanism moves out of the link groove of the first drive force transmission mechanism.

9. The link mechanism according to claim 7, wherein:

in the case where the drive force is transmitted to the slide door through the second drive force transmission mechanism, the transmission path switch device distributes a portion of the drive force, which is directed to the slide door, through use of at least one of the plurality of mechanism components of the first drive force transmission mechanism, and thereby

the transmission path switch device moves the link pin of the first drive force transmission mechanism toward an inside of the link groove of the first drive force transmission mechanism as the link pin of the second drive force transmission mechanism moves out of the link groove of the second drive force transmission mechanism.

10. The link mechanism according to claim 7, wherein the at least one of the two opposite end portions of the link groove of each of the first drive force transmission mechanism and the second drive force transmission mechanism has an enlarged width portion, a width of which is larger than a width of an intermediate portion of the link groove which is located between the two opposite end portions of the link groove.

11. The link mechanism according to claim 7, comprising a transmission link plate that is placed between the drive device and at least one of the link plate of the first drive force transmission mechanism and the link plate of the second drive force transmission mechanism, wherein the transmission link plate is configured to transmit the drive force generated by the drive device to the at least one of the link plate of the first drive force transmission mechanism and the link plate of the second drive force transmission mechanism.

12. The link mechanism according to claim 7, comprising a coupling link plate that is placed between the link plate of the first drive force transmission mechanism and the link plate of the second drive force transmission mechanism, wherein the coupling link plate forms a transmission path of the drive force, which is transmitted from one of the link plate of the first drive force transmission mechanism and the link plate of the second drive force transmission mechanism to another one of the link plate of the first drive force transmission mechanism and the link plate of the second drive force transmission mechanism.

13. The link mechanism according to claim 2, wherein:

the plurality of mechanism components of each of the first drive force transmission mechanism and the second drive force transmission mechanism, include:

a lever that is rotatably supported and has a link pin;

a common link plate that is common to the first drive force transmission mechanism and the second drive force transmission mechanism and is configured to be rotated by the drive force, wherein the common link plate has:

a first link groove which is in a form of a groove, wherein at least one of two opposite end portions of the first link groove is opened, and the first link groove is configured to be inserted with the link pin of the second drive force transmission mechanism; and

a second link groove which is in a form of a groove, wherein at least one of two opposite end portions of the second link groove is opened, and the second link groove is configured to be inserted with the link pin of the first drive force transmission mechanism;

in a case where the drive force is transmitted to the slide door through the first drive force transmission mechanism, the transmission path switch device places the second link groove in contact with the link pin of the first drive force transmission mechanism without contacting the first link groove to the link pin of the second drive force transmission mechanism; and

in a case where the drive force is transmitted to the slide door through the second drive force transmission mechanism, the transmission path switch device places the first link groove in contact with the link pin of the second drive force transmission mechanism without contacting the second link groove to the link pin of the first drive force transmission mechanism.

14. The link mechanism according to claim 13, comprising a transmission link plate that is placed between the common link plate and the drive device, wherein the transmission link plate is configured to transmit the drive force generated by the drive device to the common link plate.

15. The link mechanism according to claim **1**, wherein the slide door is configured to be slid by the action of the drive force along a moving path formed at an air passage, which is configured to conduct air to be supplied to an air conditioning subject space, to adjust an opening degree of the air passage.

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